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Manufacture and Use of Diamond Cutting Tools

I. Diamonds Extensively Used as Cutting Tools—Study of the Structure Necessary to Secure Keen Cutting Edges—Cleaving the Diamond the Work of an Expert

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THE use of diamonds as cutting points for rock boring tools, stone saws, etc., is a matter of common knowledge. As a tool for the cutting and drilling of glass, marking hardened steel, and similar jobs, where the material to be worked is too hard to yield to the cutting edge of steel, the superiority of the

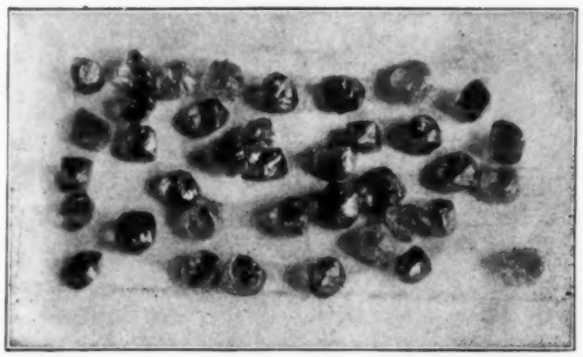

FIG. 1. GEM CRYSTALS

diamond has long been recognized. That the diamond as a cutting tool has a far wider application in certain of the industrial arts where the material to be worked is comparatively soft is not so generally known.

Every machine shop man is familiar with the diamond as a means of dressing grinding wheels; but that the same diamond may be converted into a cutting tool to do much of his work without having to be reground at all, and thus reduce the grinding wheel to a matter of secondary importance, is a fact that has yet to be demonstrated to him. There are many materials

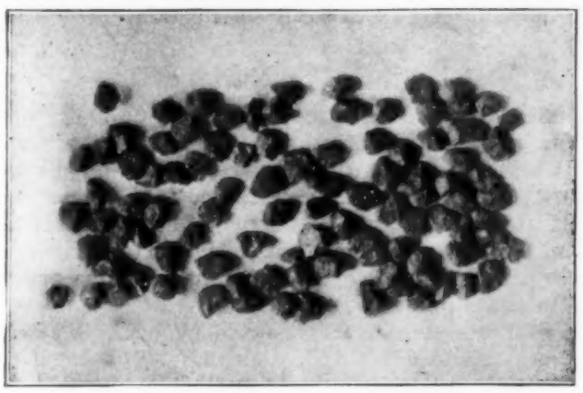

FIG. 3. BLACK DIAMONDS

represented in modern manufactured products such as fiber, rubber, paper, bronze, etc., that of themselves offer little resistance to steel tools; yet they present certain characteristics that render the cutting and shaping of great numbers of pieces a difficult and annoying proposition because of their tendency to break down quickly and wear away the keen cutting edge of steel.

Let us consider the manufacture of small articles of fiber, or of the material that is so rapidly superseding it—bakelite. Millions of small parts are being turned out every day by automatic machines that drill, counter bore, form and cut off with tools of hardened steel which require constant attention, regrinding, resetting, and continual readjustment.

The cost of making a simple forming tool of steel for such a machine may be only a few dollars while a similar tool in which the cutting edge is a diamond might cost a hundred times as much; yet the life of the steel tool is a matter of days, at best, while the tool of diamond will run for months. When the number of replacements, the cost of skilled supervision, and the

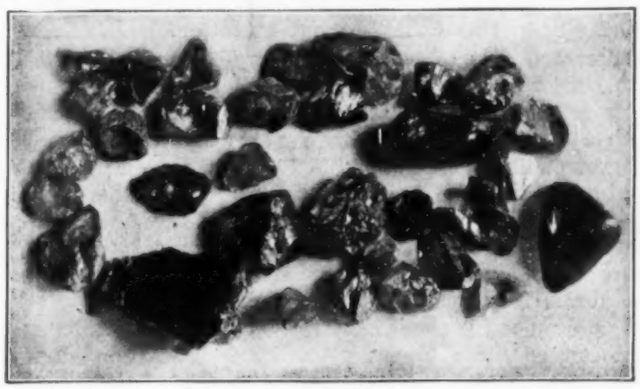

FIG. 2. CRYSTALS OF BORTZ

annoyance and expense due to variation of product are considered, it is evident that the diamond will repay its initial cost in a very short time and during the remainder of its long life will be earning a profit equal to the total of these expenses.

Another saving to be effected by the use of the diamond will come through doing away with the necessity for subsequent finishing operations. There are few products made by the use of steel tools that do not require filing, polishing, burnishing, or other methods of improving their appearance; while the product of the diamond in most instances is finished when it leaves the tool.

Brass may be considered a soft material indeed, and is readily worked with steel tools; yet all brass parts produced upon automatic machinery require finishing operations either to improve their appearance or to fit one part smoothly and snugly into some other part.

And the highly polished and smoothly sliding drawtubes of large telescopes and the equally exacting members of high-powered microscopes are regularly finished, ready for assembling, by turning them with a diamond. Parts of brass or composition that are to be plated with nickel or silver may go directly from the turning operation to the plating vats; polishing and buffing would be superfluous.

Hard rubber is by no means hard; but it is a very difficult material to finish with steel tools, and it is almost impossible to turn a piece parallel because of the rapid and uneven wear of the cutting edge. Parts of

FIG. 4. EXAMINATION PREPARATORY TO CLEAVING

fountain pens have their surfaces left so true and smooth when turned with the diamond that no subsequent fitting is necessary, and the diamond runs for months upon this work without attention.

Electrical devices which have parts of brass molded into hard rubber or bakelite, have their composite surfaces left as smooth as though polished, when turned with a diamond, and the brass parts are not recessed or protrouding, as is quite likely to be the case when steel tools are used for the turning. The rubber rolls on typewriters are certainly about as soft as any material that is regularly worked by machine tools; yet there are but two successful means of finishing them—the abrasive wheel and the diamond.

The diamond is practically the only thing of which a tool can be made to cut materials harder than steel. Glass, marble and porcelain are but a few of them that are commonly cut with diamond tools. By the same means rubies, sapphires, and other so-called precious stones are drilled, cupped, and formed to take their places as bearings in intricate and precise mechanism.

The diamond is the hardest known substance. In the scale of hardness its number is 10, while carborundum, its nearest neighbor, stands at 9; but there is many times more difference in relative hardness between 10 and 9 than there is between 9 and 1. The diamond is also very brittle and in this characteristic may be found its limitations; it will not stand severe transverse strains or heavy pressure unless very well supported, and for this reason it is not suitable for turning tough, homogeneous material like iron and steel. It is, however, used upon this material to some extent for the purpose of marking scales, verniers, and other instruments of precision where the marking must be done after hardening to insure accuracy.

The average rough diamond presents a very ordinary and unattractive appearance, differing in no visible respect from millions of pebbles that may be picked up along any sea beach. Diamonds vary little in hardness but a great deal in color and structure. The gem that sparkles upon the shirt bosom of the millionaire (or the war-time mechanic) is not physically different from the stone that is sometimes used to turn off a grinding wheel, except that it is colorless and has been highly polished.

Both come from the same mines. Those stones sorted out as unsuitable for polishing into gems, due to undesirable color or to flaws in the structure, are called "bortz." The value of a crystal of bortz varies with the size and quality of the stone from fifty or sixty dollars per carat for a fine large stone down to about five dollars per carat for flawed fragments or small discolored stones. (A carat is only about the $\frac{1}{4}$ part of a Troy ounce). The majority of diamonds found unbroken are in the form of octahedrans (eight sided six pointed crystals). Fig. 1 shows a small lot of such

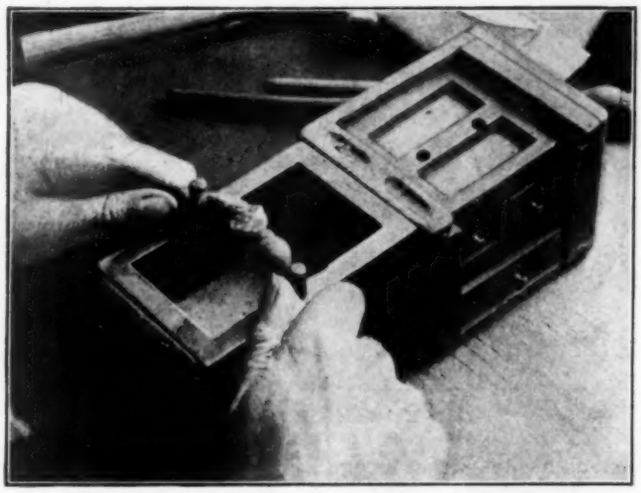

FIG. 5. STARTING THE GROOVE

crystals not quite good enough for cutting into gems because of color, but they are of flawless structure and represent the very best quality of bortz. Fig. 2 shows portions of exceptionally large crystals. Some were found in this condition in the mines, others sawed or cleaved in the factory where the material for this article was obtained. In the diamond trade this form is called "block." Incidentally, the cash value of the small handful of "block" shown in this picture is $6,440.

Black Diamonds

Chemically considered the diamond is pure carbon, but this element is somewhat peculiar in that it may exist in several forms without great difference in chemical purity. The final stage is reached in the colorless octahedral crystal, that is the diamond, but there seems to be many steps to the process as carried on in Nature's laboratories in converting the comparatively soft, amorphous material into the finished product.

One of these steps is represented by what is called the "black diamond." Black diamonds are but partly or imperfectly crystalized, are of a rather porous nature, and possess practically no cleavage grain. They are of about the same degree of hardness as the white diamond but as they do not lend themselves readily to the process of shaping, they are used principally as cut-

ting points in rock drills, marble saws, etc., where little alteration of the original form is necessary.

Black diamonds are at present found only in Brazil and are not nearly so plentiful as is commonly supposed. Because of this fact and, further, because they are in great demand for the above mentioned purpose, the market value is somewhat in excess of that of bortz.

To the diamond trade the black diamond is known as "carbon." A number of lumps—they can hardly be called crystals—may be seen in Fig. 3.

Lines of Cleavage

The structure of the diamond is of great importance to the manufacturer of diamond tools. The crystal

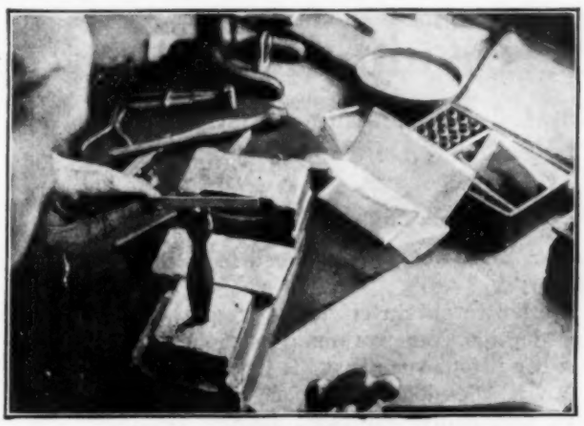

FIG. 6. CLEAVING THE CRYSTAL

presents a sort of grain, or line of cleavage, along which it may be split, and in making cutting tools it is necessary to study the structure in order to determine at what places the crystal may be cleaved to obtain in rough outline the shape desired. Owing to its brittleness, any attempt to divide it in a direction not in the line of cleavage is certain to result in shattering the stone, and since diamonds are worth much more per carat in large than in small pieces, this means reducing its value from forty or so dollars down to perhaps five dollars per carat, not an inconsiderable loss in a stone that may weigh upwards of twenty carats. For this reason the diamond cleaver must be a man of experience and sound judgment in this work. Such a man may study a crystal for hours under the microscope before making any attempt to cleave it.

Contrary to the commonly accepted notion, cleanliness and freedom from dirt is *not* characteristic of the diamond cutter's trade. Instead of the immaculate linen in which they are usually pictured, its devotees wear overalls and jumpers like any machine-shop employee and their hands and faces are apt to resemble those of a machinist's helper after a hard day's work. A great deal of their work is done with diamond dust suspended in olive oil and this mixture is as black as the combination of cast-iron dust and machine oil—and quite as pervasive. Fig. 4 shows a diamond worker's bench and tools, with the

FIG. 7. THE CRYSTAL DIVIDED

diamond worker himself examining a crystal under a jeweler's glass preparatory to cleaving it. The implements at his left are not drumsticks, but are the holders with which he will later handle the stone to be cut as well as the stone with which he will cut it. They are of wood with a cup-shaped depression in the larger end, into which cavity the stone will be set and held by diamond cutter's wax; a hard yellow preparation resembling beeswax in appearance but much less pliable. This wax is softened by heat from a gas burner or alcohol lamp to a degree that enables the worker to mould it around the stone with his fingers, and when it is hard it will withstand any ordinary pressure.

The bortz crystals are but indifferently translucent before the rough skin is ground off, some of them being practically opaque. It is therefore necessary as a preliminary operation to polish off a small facet somewhere in each crystal to let in the light and permit the worker to examine the interior. Having determined the direction of the cleavage lines and the most advan-

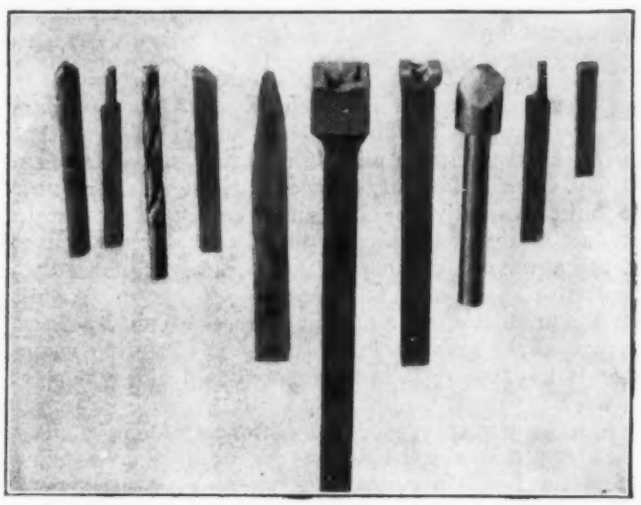

FIG. 8. TOOLS WITH CUTTING EDGES OF DIAMOND

tageous place to start, the diamond worker mounts the stone in one holder, affixes to another a sharp splinter of diamonds and proceeds as illustrated in Fig. 5 to cut a groove in the stone at the place where he expects it to divide.

A characteristic peculiar to the diamond is that one diamond will cut another diamond. A man might take two pieces of steel of equal hardness and scrape them together until his hair was gray without affecting anything but his disposition; but let him, with proper knowledge of the art, scrape one diamond with the sharp corner of another and, although he will wear away the keen edge of the cutting diamond and have to turn it around from time to time to *keep* it cutting, it will not be long before he has an appreciable groove in the other stone. The groove need not be very wide or very deep but it must be in exactly the right place—it must coincide with the lines of cleavage.

Placing the holder containing the stone to be split in an upright position by sticking it through a hole in his bench block of lead, he sets the edge of a steel knife in the groove, as in Fig. 6, and strikes it a sharp blow with a hammer. The result is shown in Fig. 7.

The diamonds are seldom cleaved or otherwise divided solely for the purpose of getting smaller pieces. Usually a stone is selected as nearly as possible to the size of the tool to be made, in order to reduce the cost

per carat, but in the case of Fig. 7, a piece approximately ¾-in. square was needed.

In Fig. 8 may be seen some samples of diamond tools. If this picture be examined with a glass it will be noted that each tool has one or more cutting lips formed of pieces of diamond crystal brazed to the steel holder. The first tool to the right of the center of the group is a forming tool having an exceptionally large diamond, and it is for a duplicate of this tool that the stone in Fig. 7 is to be used.

The value of this particular tool is around three hundred dollars, but when one considers that its counterparts have run from six to nine months, forming the edges of thousands of fiber disks daily, *without resharpening and practically without readjustment*, one may see that the tool cost per piece is insignificant when compared with the performance that could reasonably be expected from a steel tool of similar shape.

The tool at the center of the group in Fig. 8 performs an operation similar to the one just described and upon the same material. This tool has two diamonds, set in inserts of steel so that they may be adjusted to form different curvatures by turning the inserts. Fig. 8 also shows drills, counterbores, side-tools, cutting-off tools, and plain turning tools; each with a cutting lip or lips made from a diamond.

Laying Out a Factory for Production Work

How Kind and Amount of Equipment Are Estimated—Arranging Machines—Uses of Operation Sheets—Equipment Records—Conveyors

BY FRANK W. CURTIS
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THE ideal factory is so arranged that work in process passes through it with a minimum amount of handling. It is seldom however that the ideal is realized, although it may be approached closely. Under the very best conditions a factory may be built expressly for the manufacture of a certain product so that with proper planning and arrangement of machines, the routing of the work is in perfect accord with the system of handling. In a factory built for the production of a particular mechanism, a definite change in the arrangement of machines is often necessary if the factory is to be adapted to a different class of work.

A large percentage of the factories of our country were not specially built for the product now being manufactured. In many cases where the same variety of product is still made, it has been developed and changed to a great extent. Improvements have been made and refinements incorporated, so that it is quite different from its original form. Developments in machine tools have been rapid in the last few years and methods of manufacture have kept pace with the progress made in the designing of machinery. In some kinds of work the use of automatic machines of various kinds has revolutionized the entire industry, thereby effecting great changes in methods and in the handling of the product. In considering the possibility of changes both in product and methods, it will be obvious that factory arrangements should be of a flexible nature as far as possible. Consideration must be given to future activities, possible enlargement of plant, change in product, and any other matters likely to affect the efficiency of the factory.

If a factory is to be purchased and adapted to a new product, the location is important not only on account of shipping facilities but also in connection with the employment of labor and the housing situation. These matters are only mentioned in passing and will not be touched upon further in this article. Their importance, however, must not be overlooked in selecting a site for a factory.

In order to obtain efficiency from the human factor in production, the workman must be able to operate under conditions such that his bodily comfort is assured as far as possible. A poorly lighted, insufficiently heated and badly ventilated factory results in imperfect, inaccurate work, dissatisfied workmen, and low production. Men cannot be expected to do good work in a poorly lighted shop or in one not properly heated or ventilated.

Good lighting is essential in plant layout work and care should be taken to see that light of suitable quality and quantity is obtained. The direction of the light in its relation to the machine and the work is also important. Modern factories are so built that sufficient daylight is provided for the majority of the machines by the use of open sash windows and by constructing long, narrow buildings when several floors are necessary. Saw-tooth roofs are used when one-story buildings are required, the overhead lighting being ample for the majority of conditions.

The eye has adapted itself to daylight as a natural light, hence artificial lighting should approach that given by day-light as nearly as possible. When artificial light is used, if the lights are properly arranged, it will be found generally satisfactory. Care should be taken

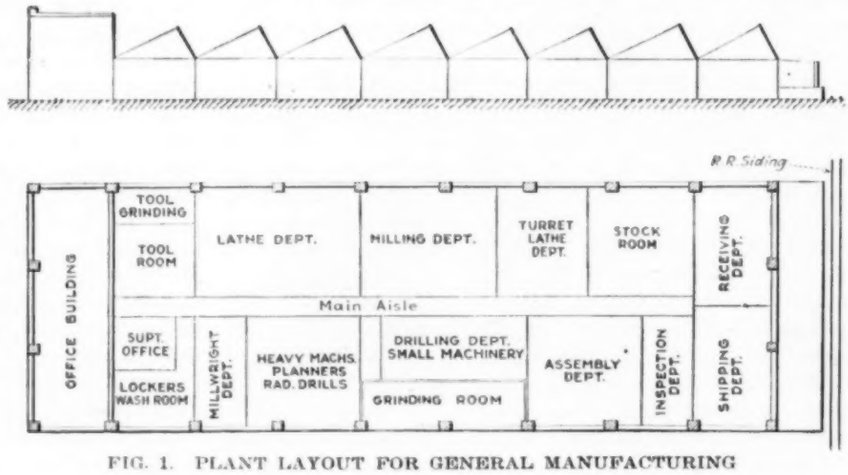

FIG. 1. PLANT LAYOUT FOR GENERAL MANUFACTURING

to avoid "glare" caused by poorly-arranged lights or when the location of lights within the field of vision, which causes discomfort and eye fatigue. The direction of light rays should be such that no deep shadows will be thrown on work which is to be machined or inspected. Shadows are very annoying if they are deep and sharp as it is then very hard to distinguish between shadows and objects.

Artificial lighting is of great importance in the proper operation of a plant. Proper lighting will not only increase production but will prevent accidents, improve health conditions and decrease spoiled work. It is the general practice to have walls and ceiling of a factory painted a dull white. Care should be taken not to use a glossy paint as this reflects light and causes trouble.

Accidents are often the result of poor lighting; records kept in one factory showed that 20 per cent of the accidents for a year were due to improper lighting

MACHINE Colburn Drill Press No. T-556
SIZE #2 Heavy duty manufacturing
DEPT. 36 PART No. 1430 OPER. 25
PURCHASED April 19-1921
Drill capacity 1 1/4"
Distance center of spindle to column, 10"
Max. distance, nose of spindle to table, 28"
Length of power feed, 12"
#4 morse taper shank
Table size, 16" x 16" Floor space, 24" x 45"
NOTE:- KEEP REPAIR RECORD ON REVERSE SIDE

FIG. 2. MACHINE RECORD CARD

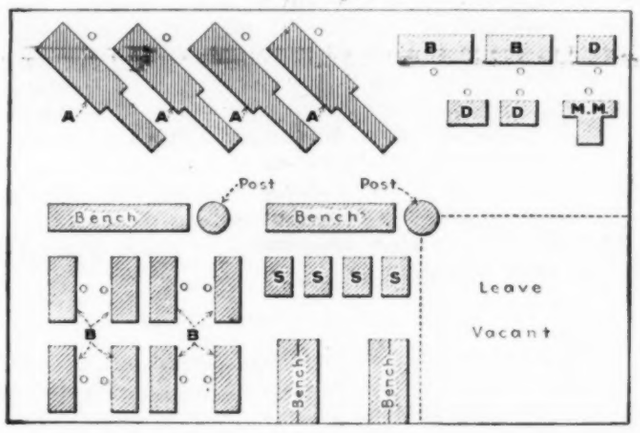

FIG. 3. SECTION OF FACTORY LAYOUT, SHOWING MACHINES CORRECTLY POSITIONED

facilities. Factories which have installed modern systems of lighting have found by their records that a great reduction in accidents has been made after the installation.

The method of heating a factory and its ventilation are important factors which are dependent to some extent upon the type and general features of construction. The writer will not go into this matter in detail as it is somewhat out of the field of this article.

Greater efficiency is obtained from workmen when a normally uniform temperature is obtained throughout the factory by judicious planning of the heating and ventilating facilities. Sanitary arrangements should be made and suitable washrooms provided with lockers or provision of some sort for the workmens' clothing.

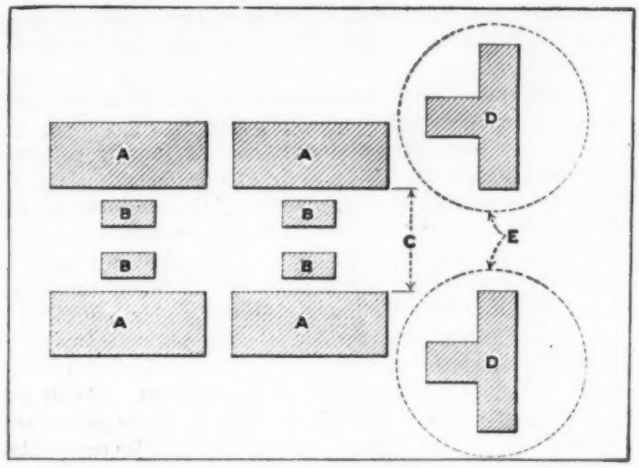

FIG. 4. SPACING AROUND MACHINES

These matters also, although they are important, will not be discussed in this article.

There are several factors to be considered when making a plant layout, the first of which is the product that is to be manufactured. It is evident that a plant for the production of a certain kind of mechanism and intended only for this purpose, could be designed and the equipment arranged to facilitate the production of this particular product. For general manufacturing, however, a different arrangement might be required, and for highly specialized work the arrangements might be very much changed according to the class of work to be produced. Fig. 1 shows a plant layout design for general manufacturing. The arrangement of the various departments is subject to more or less change according to the design of the factory, but in the example indicated a one story factory is shown with a modern saw-tooth roof construction and ample day-light lighting facilities. The foundry, patternshop and drop forging departments have not been considered in this layout as they would naturally be taken care of by means of other buildings. The office, though a part of the factory, is a separate building at one end of the main factory building. The superintendent's office has been partitioned off in the factory itself rather than to provide space for this in the office building. A railroad siding is arranged at one end of the building and here both receiving and shipping departments open on to a loading platform. A wide main aisle through the center of the building provides access to the various departments. There are no partitions to separate the various departments, with the exception of the grinding room which is partitioned off to prevent dust from the abrasives used being carried along throughout the shop and damaging other machinery. An arrangement such as that shown allows work to be taken from either receiving department or stockroom to any of the various departments by means of the main aisle. The assembling and inspection departments are close to the stockroom and shipping department, so that there will be as little handling as possible after the work has been completed. A department has been set aside for the millwright and his assistants, this being arranged close to the superintendent's office. The toolroom and tool grinding departments are also at this end of the building. The other departments are arranged conveniently with respect to the general run of manufacturing work.

In any sort of a factory it is important to have a

record of the machines, their location in the factory, and the work upon which they are engaged. A record of this kind can be most conveniently made by means of a card index such as that shown in Fig. 2. On this card can be recorded the important data concerning the machine, in such shape that it can be readily referred to when changes in design or in the production schedule requires a change in equipment. All machines should be given a factory number and their location specified according to department. It may be also advisable in factories where the same product is being manufactured continuously to make a cross index containing the number and name of the part manufactured so that each operation on the part can be identified along with the machine used in the production. Much depends upon the kind of work that is being done and records of this kind must be made to suit the particular condition involved. It is a good idea to include on the card index of machines such data as the date when the machine was purchased, the equipment that goes with the machine, general data regarding its capacity, condition of the machine and when it was last overhauled or inspected, together with any other matters of importance which will be of assistance to the engineering department when referring to the card.

Method of Making Factory Layouts

When a layout of machine tools in a factory is to be made it is essential that a list of operations together with the routing of the work should be furnished to the plant engineer in order that he may arrange the machines so that the work will go through the shop in a regular and orderly manner. With the operation sheets as a basis, the routing of the work is predetermined and machines can be arranged suitably without great difficulty. It is customary in preparing for work of this kind to make a brown paper layout of the factory showing location of all posts, pillars or other obstructions throughout the factory. This layout is made to a suitable scale according to the size of the factory. The various machine tools that are to be used are laid out in plan according to their outside dimensions. These are made to the same scale as the factory layout and are drawn up on cardboard and then cut out. By using these cardboard forms it is easily possible to arrange the machines in miniature and change them about here and there until the best possible arrangement has been found. A pin is stuck through the center of the cardboard form and fastened on the factory layout. Fig. 3 shows the general appearance of a portion of a factory with cardboard forms in their correct position. A layout of this kind often takes considerable time in order to obtain an arrangement which will give the best results. The superintendent, factory foremen, production superintendent and tool engineer frequently sit in a conference and make suggestions regarding arrangements. The position of line shafting and arrangement of motors for group drive are often considered at the same time.

After this layout has been approved, a draftsman traces the outline of the machine on the brown paper drawing, using the cut-out forms as a guide. The forms are then removed and a tracing is made of the whole layout. From this tracing the millwright works when placing machines in position. In many cases it is possible to put dimensions on the factory layout to show the positions of the various machines; this is more satisfactory than to allow the millwright to use a scale on the drawings. In the example shown the machines marked *A* are turret lathes, which are set at an angle in order to allow for the use of bar stock. *B* indicates the positions of lathes, *D* drill presses and *MM* milling machines. The positions of the benches are also shown and a group of shapers is marked *S*.

Spacing Around Machine.

One of the important points in connection with making a factory layout is the allowance of sufficient space around the machine so that the workman will have plenty of room, not only for himself but also for the work in process. Fig. 4 shows a diagram representing a group of machines showing the positions of the operators and the space required around the various machines. Several points must be considered in allowing space enough so that there will be no congestion. First, the operator must have room enough to get around the machine without approaching too closely to another machine or another operator and thus interfering with the other man's work or running into trouble by approaching too closely to moving parts of another machine. Engine lathes must be so spaced that the operator can change the gears at the end of the lathe without difficulty and he may also be obliged to get around back of the machine in certain cases so that it is always advisable to allow sufficient space for this also. Second, the piling up of stock around a machine is inclined to cause trouble unless provision is made for the purpose, hence on any kind of a machine which is producing work even in small quantities there should be places provided for "tote" boxes or other carriers or holders which will be used in the conveying of the work from one department to another. Third, the various movements of the machine must be considered and sufficient space left around it so that even when in the extreme position there will be sufficient room for an operator to work or for "tote" boxes to be stacked. In the example shown *A* represents the position of the engine lathe, *B* the operator and *C* the distance required between the machines. *D* shows a couple of milling machines and the dotted lines *E* show the amount of space necessary on all sides of them.

The Operator's Requirements

This same procedure should be followed out with all classes of machines, always keeping in mind the safety of the operator, his convenience in handling the machine, the material which is being handled and a place for it both before and after machining, and the necessity for space around the machine so that any adjustments which may be required can be easily made without interfering with any operator. The engineer who lays out the factory must have a considerable knowledge of the working of machine tools and the requirements of the operators. In an old shop where the line shafting is completely installed, when it is necessary to use this shop on a different kind of production than that for which it was originally intended, the position of the line shafting may be a considerable factor in determining the placing of machines. It must be remembered, however, that modern methods may require changes in line shaft positions and although the cost may be considerable the production will be improved if up-to-date methods are used.

(Continued in next week's issue)

Automotive Service Methods and Equipment

VI. Tools in Use for Servicing the Mack Truck—Disassembling the Jack Shaft—Service Operations in a New York Taxicab Station

BY HOWARD CAMPBELL
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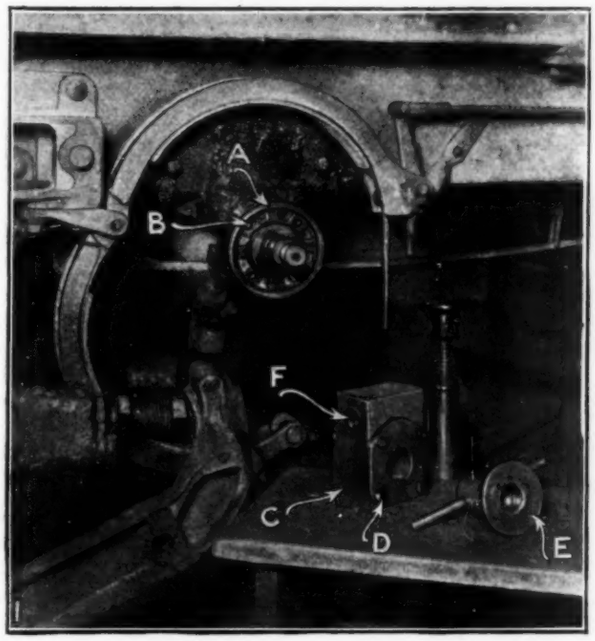
THE New York service plant of the International Motor Truck Co., builder of Mack Trucks, is well equipped with tools for service work, most of which were made in the plant. A number of these are described and illustrated herewith.

In Fig. 1 is shown a jackshaft and its retaining collar and the tools with which both shaft and collar are removed from the chassis, when it becomes necessary that they be disassembled. In the jackshaft retaining collar *A* are drilled four blind holes *B*, all being drilled on the same radius and equi-distant from each other. In the block *C* are four pins *D* which fit into these holes. To disassemble the jackshaft, this block is slipped over the shaft so that the four pins fit into their respective holes, the shaft projecting through the hole in the center of the block. The piece *E* is threaded inside so that it can be screwed on to the shaft, which is done. Then a bar is put through the hole *F* and block, shaft, collar and bearing are screwed out of the bearing hanger.



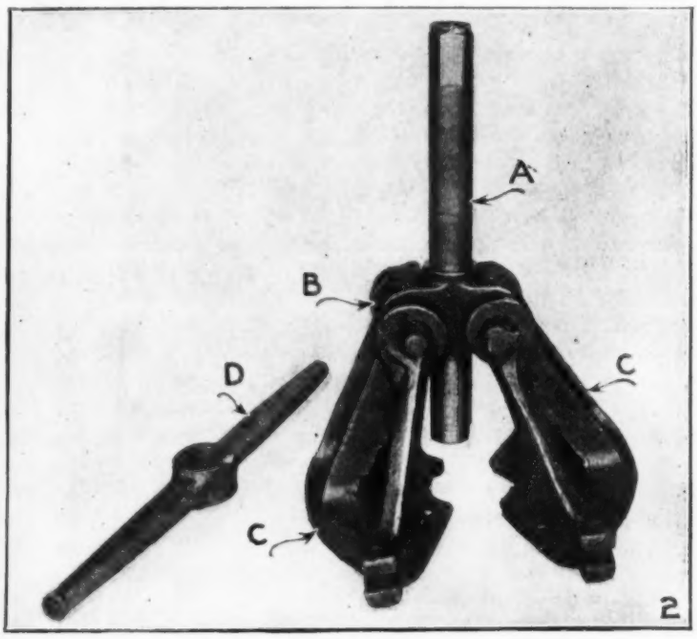


FIG. 1. END OF JACKSHAFT AND RETAINING COLLAR, WITH TOOLS FOR DISASSEMBLING.
FIG. 2. JACKSHAFT SPROCKET PULLER

A tool for pulling the jackshaft sprocket and brake drum is shown in Fig. 2. This consists of a threaded pin *A*, the piece *B* through which the pin is screwed, and the parts *C* which are hinged to the piece *B*. The handle *D* is used for turning the pin. The operation of the tool is shown in Fig. 3. Here the end of the pin *A* is placed against the end of the jackshaft and the two parts *C* engage the back side of the jackshaft sprocket. Then when the pin is turned, as shown in Fig. 3, the sprocket is pulled from the shaft, bringing with it the hub-end drum. This tool is very heavy and would undoubtedly be capable of pulling from 6 to 10 tons in the manner described.

A variety of "home-made" tools is shown in Fig. 4. The piece shown at *A* is a tool for seating bearing shells into the bearings and caps while they are being fitted. The piece *a* which has the same outside diameter as that of a crankshaft sets down into the bearing while it is being fitted to the cap.

The tool is long enough so that the studs pass the ends of the bearing and through the block *b*. Thus, when the nuts are pulled up on these two studs, the bearing shell is drawn tightly into its seat. At *B* is a piece which is clamped by bolts through the two holes shown, to the water-jacket cap of a motor so that the motor may be swung from an overhead trolley. A similar tool is shown at *E*, excepting that this eyebolt screws into the valve cap hole. A tool for pulling the camshaft gear is shown at *D*. The three long bolts screw into the three tapped holes in the camshaft gear and the end of the bolt centers in the end of the camshaft. Thus, when the bolt is screwed into the piece the gear is pulled off.

The rings *F* and *G* are test gages for fitting piston rings, the different sizes being for two different sizes of rings. Each gage is turned from solid steel and each is counterbored the depth of a ring and just large enough so that when a ring has been properly fitted, it will just fit into the counterbore. This eliminates the necessity of trying the rings in a motor cylinder while fitting them. At *H* is shown a tool for assembling connecting rod bearings to the rods. The part *a*, being cylindrical, seats into the bearing shell. The two screws shown are screwed against the back side of the section, thus pulling the bearing shell firmly into its seat. A similar tool is shown at *C*.

The crankshaft in a Mack truck motor is 3 in. in

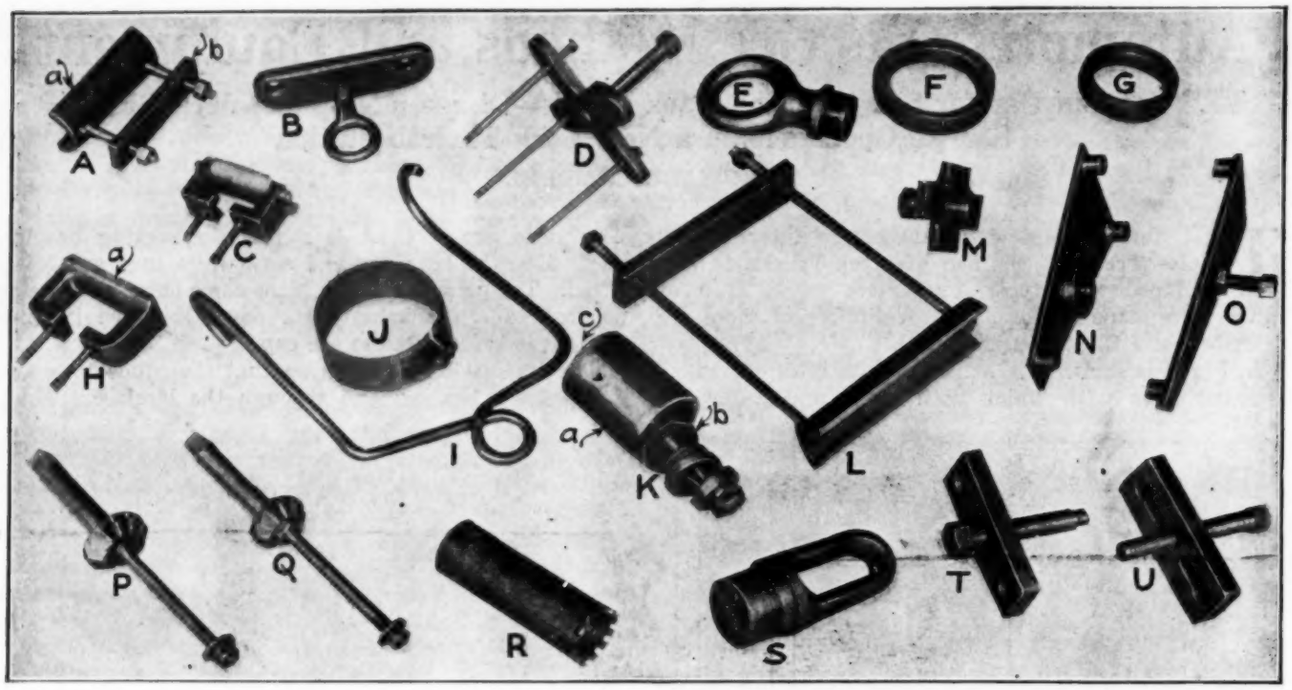


FIG. 4. TOOLS FOR USE IN SERVICING MACK TRUCKS

diameter at the bearings. Consequently the task of lifting it in and out as it is being fitted to the crankcase is rather laborious. To assist the workmen in this operation, a cable is arranged over two pulleys so that a counterbalance can be fastened at one end and the other end used to lift the crankshaft with the aid of the hook shown at *I*. The ring shown at *J* is clamped around the piston rings after they have been assembled to the connecting rod, so that the rod and rings can be inserted into the cylinder. This clamp compresses the rings as required, but the clamp is just large enough so that it will not enter the cylinder, hence as the piston and rings slide into the cylinder, the clamp is left behind.

The tool shown at *K* is for pulling the camshaft bushing from the crankcase. The cylinder *a* is large enough so that the bushing will very easily slip through it. The ring *b* is seated against the inner end of the bushing and the bolt run through it and out through the cylinder *a*, which rests endwise against the outside of the crankcase, the end of the cylinder encircling the end of the bushing. Then when the nut *c* is tightened, the bushing is drawn out of its seat in the crankcase into the cylinder *a*. Adaptions of this tool could be used in a variety of places. The tool *L* is for assembling large bearings to bearing caps, similar to the tools *A* and *H*. A tool for pulling a crankshaft gear from the shaft is shown at *M*. The action of this tool is similar to that of the camshaft gear puller *D*. Screws are put through the holes shown and screwed into holes in the gear. The end of the screw is placed into the center of the shaft so that the action of turning the screw draws the gear from the shaft.

When a crankshaft has to be fitted to new bearings, it is frequently necessary to do this while the camshaft is in place. As the crankshaft and camshaft gears are of the spiral variety, the action of turning the crankshaft over tends to work the camshaft out of its bearings. To avoid this, the piece *N* is clamped over the end of the camshaft. Screws are put through the

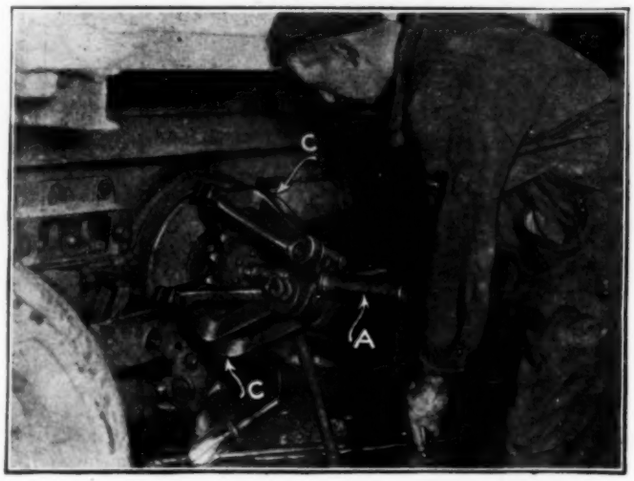


FIG. 3. PULLING OFF THE JACKSHAFT SPROCKET

three legs shown and screwed into three of the gear case cover holes, the thrust of the shaft being received on the end of a screw extending through the boss in the center of the piece. A similar piece, though for a different style of motor, is shown at *O*. The central screw is here shown in place.

At *P* and *Q* are shown two valve seating tools, the different sizes being for two different types of motors. The use of the tool is obvious. The point of interest here is that the washer at the lower end of the spindle is keyed to the spindle so that while the washer is loose and can slide up and down, when the tool is turned the washer turns with it. Thus the tool is fed into the work by tightening the nut with no fear of trouble due to the nut working either tight or loose.

The tool *R* is a special wrench for adjusting the motor cross-shaft roller bearings. This is made of a section of steel tubing of such diameter that when teeth are cut in one end as shown, these teeth will fit into corresponding holes or slots in the bearings. At *S* is shown another eyebolt for use in lifting motors. This is for

the same purpose as the tool *E*, screwing into a valve cap hole in the same manner. The difference in the sizes of the threads is accounted for by the difference in the design of the motors.

The pieces *T* and *U* are used to aid in assembling main bearing shells to their seats in the crankcase. Bolts are put through the two holes in the block and screwed into stud holes on opposite sides of the bearing. Then the bearing shell is put in and held in place by the central screw while the edges of the shell are being filed flush with the bearing. The two pieces are used in the same manner, except that while the tool *T* can be used on only one size of bearing, the slots in the piece *U* make it possible to use this on practically any of the bearings now in use.

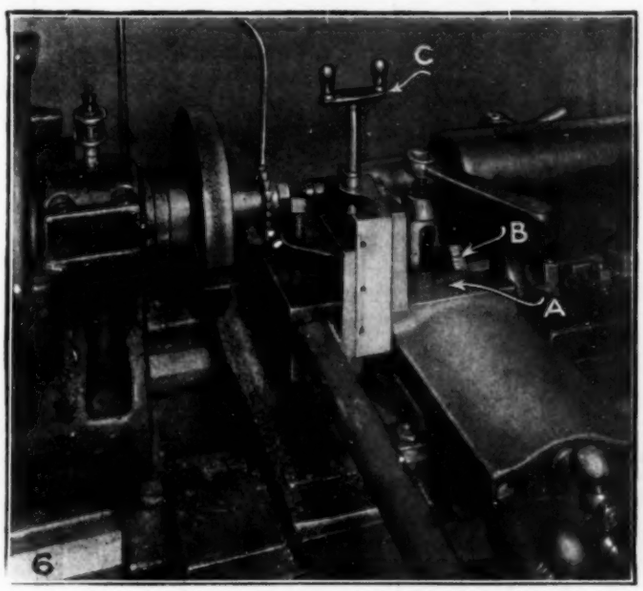
The equipment described and illustrated below is in use in the service plant of the Black and White Taxicab Co. in New York City. The operator shown in Fig. 5 is welding steel on to the worn-out thread on the end of an axle shaft. After this is done, the end of the shaft is turned and threaded again. The keyway is also filled up and cut over again, using the equipment shown in Fig. 6. The attachment has a projection *A* which has a wide slot milled in it so that it will straddle the toolpost as shown. By putting a piece of steel in the toolpost, as shown at *B*, the attachment can be held securely. The handle *C* is used to raise and lower the piece, the action being similar to that of an ordinary slide-rest. It can also be swung at an angle, as shown, so that the keyway will be cut the same angle as that of the tapered end of the shaft. The cutter used is a $\frac{1}{16}$-in. side milling cutter, attached to a stub arbor, which is held in the spindle.

FIG. 5. WELDING METAL INTO THE WORN-OUT THREAD ON AN AXLE SHAFT

FIG. 8. REINFORCING A SIDE MEMBER

Another "home-made" tool is shown in Fig. 7. This is a fixture for holding differential carriers on the faceplate of a lathe in order to thread them for the drive shaft pinion adjusting nut. The fixture is made of two halves of Brown-Lipe clutch drums, welded together with the flanges out as shown. One flange is bolted to the faceplate and the other is drilled so that the differential carrier can be bolted to it. Two of the adjusting nuts are also shown in the photograph.

The use of the electric drill in service repair work is demonstrated in Fig. 8. Here one of the frame side members has broken so that it became necessary to weld the two pieces together again. To prevent further breakage at this point, a steel plate was also welded on, as shown, and the operator is further reinforcing the piece by drilling holes through the frame and plate, so that the plate can also be bolted on.



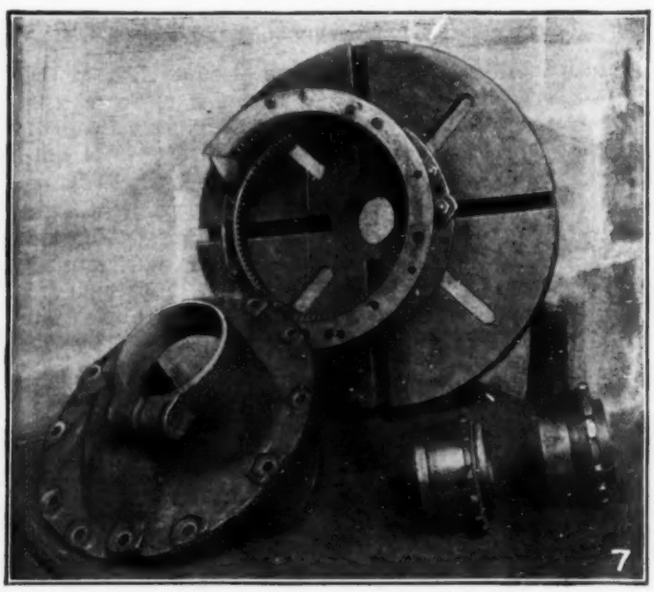
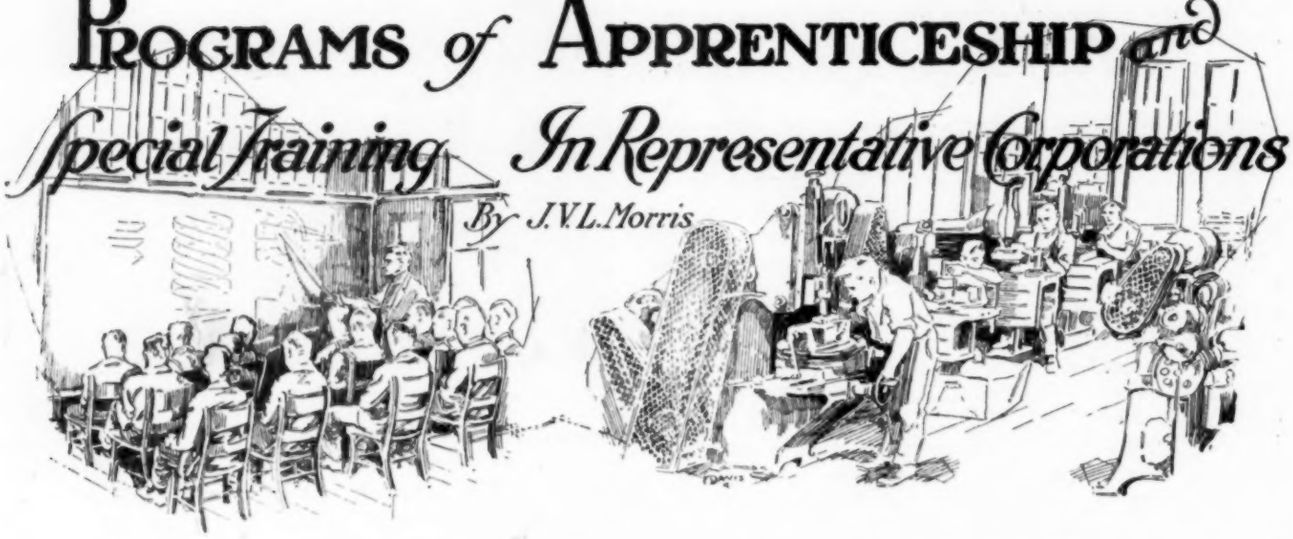


FIG. 6. MILLING KEYWAYS ON A LATHE. FIG. 7. A "HOME-MADE" LATHE FIXTURE

Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



XVIII. The Atchison, Topeka & Santa Fe Railway

Shops Widely Scattered—Shop Instructors Provided—Both School and Shop Work Given—Apprentice Board Handles Each Case—Course for Graduate Apprentices

THE Atchison, Topeka & Santa Fe Railway system offers the outstanding example of apprentice training in railroad shops. This railroad, as is well known, has a system traversing sparsely-settled and almost uninhabitable country, with no near-by roads, shops, or manufacturing plants from which to draw mechanics. Their scarcity in the face of rapidly expanding business in 1907 led the management to decide that if they could not hire the machinists needed they would train them. An apprentice system was forthwith inaugurated by the appointment of a supervisor of apprentices. At present in its thirty-six railroad shops scattered from Chicago to San Francisco over thirteen hundred apprentices are being trained in the following trades: Machinists, 795; boilermakers, 175; sheet metal workers, 79; car carpenters, 234; electricians, 12; blacksmiths, 22; painters, 13.

Shop Instructors

Under the direction of the general supervisor of the whole apprentice system in each center is found one or more shop instructor at the approximate ratio of one instructor to twenty-five apprentices. These instructors have general charge of the apprentices while at work, both instructing them and arranging their transfers from one type of work to another. It should be stated that in no case is the training and transfer of apprentices left to the shop foreman. It is believed that the use of shop instructors is a noteworthy feature of this railroad's apprentice program. They say of the instructor: "He is selected from the ranks, a man of character, skilled in his trade, patient in his teaching and capable of imparting his knowledge intelligently to the boys in his charge."

By the plan in force the shop instructor ranks along with the department foreman and both report to the same shop officer. If the foreman is temporarily absent, the instructor takes his place. If the shop is large enough to afford ample facilities, a fixed schedule is outlined for each apprentice to pursue. This is so arranged that he may complete the course in three years and six months, leaving six months for review or specializing.

In the midst of the shops, preferably in a separate building, there is fitted up a schoolroom for the supplementary instruction. The apprentices here assemble in classes at stated hours for instruction in mechanical and freehand drawing, practical shop arithmetic, mechanics, some descriptive geometry, algebra, etc. A treatise on the particular trade being taught, the materials used, and a little railroad business letter writing also form elements of the course. By a generous equipment of charts, working models and reading matter, different auxiliary devices are studied, such as injectors, lubricators, safety valves, and air brakes. The apprentice is also required to learn the company and Federal rules pertaining to his trade.

As this school is intended to be a center for the whole shop, where foremen, mechanics, officers, and clerks can and do obtain information and help upon any mechanical device or question, the school instructor must necessarily possess a good technical training in addition to an extended railroad and teaching experience.

Selection of Apprentices

Apprentices are selected in the order in which their applications are filed. Each boy applies to the local master mechanic or shop superintendent, who turns him over to the apprentice instructor for an examination. Educational qualifications of an applicant are not ironclad, as some of the applicants have had but limited opportunity and yet are considered good material if they are industrious, ambitious, and of good habits. If, on the other hand, plenty of opportunity has been available for schooling, the examination is rigid. In age the sixteen-year-old applicant seems to get the preference, except in California where a minimum age of eighteen is fixed by law. In freight-car work the minimum is, however, nineteen; but the course is only two and one-half years in length, instead of the four years required in other trades. The average

schooling for the machinist, boilermaker, and blacksmith is about eight and one-half to nine years, and in some places a little more; while the freight-car carpenters average in preparation between the sixth and seventh grades, and have probably been out of school since they were fourteen.

The pay of the apprentices is at the following rates per hour: 1st six-month period, 29 cents; 2nd period, 31½ cents; 3rd period, 34 cents; 4th period, 36½ cents; 5th period, 39 cents; 6th period, 41½ cents; 7th period, 46 cents; 8th period, 54 cents.

Apprentice Board

The successful fitting of apprenticeship into the production and maintenance work of the shop without friction is ascribed to the apprentice board, which is composed of the general foreman, department and gang foremen, the shop instructors and the school instructor. Every apprentice, either in person or by name is brought before this board every six months during his entire apprenticeship. Everything in reference to such matters as the progress, discipline and transfers of the apprentices are handled by recommendations from this board to the mechanical officer of the shop for his action, and finally by reference to the supervisor of apprentices.

This administrative plan is particularly stressed as essential to the successful working of the system, as it leads each shop officer to take a personal interest in the apprentices. It is also said to have "created an interest in the other shop employees by the foremen, a personal interest and desire upon the part of each foreman to treat all his men with that interest and feeling which begets loyalty and service." It would seem that this secondary function parallelled that of the foremen's school now found in so many progressive plants.

Special Course for Graduate Apprentices

Engineering college graduates are also admitted to a two-year course, one year on machines and one on the erecting floor. While in this course they are known as special apprentices.

A selected group is then made up of those who have made a satisfactory showing in this two-year course for college men, and of others from the regular apprentice graduates. These picked young men are put through a year's training for development into future company officers.

This year of training is made up as follows:

(1) The apprentices serve two months in the boiler shop, where they familiarize themselves with flues, patches, front end, Federal laws, etc., taking at the same time a course of reading and study on boilers and equipment.

(2) Following this, they enter the freight car shops to serve two months on trucks, bodies, air brakes and inspection, while at the same time pursuing a course of study of standards in car work.

(3) Their next appointment is for four months in a roundhouse, where they are taught the complete operation, from the time when an engine enters until it is headed out in good condition. This includes cleaning the fire, fueling, watering, repairing when necessary, and the "paper work" of despatching and handling reports. This is accompanied with the study of a text on locomotives.

(4) The traveling engineer next takes them in charge, teaching them to fire with a study of fuel economy, to operate the engine, make out the road foreman's report, and at the same time make a study of the individual parts of the machinery, such as lubricators and safety valves. Along with this they must be absorbing Federal and company rules for the inspection and care of locomotives.

(5) The last assignment is for one month each inspecting incoming and outgoing locomotives. This brings to a close the year's graduate apprentice course.

Every month each special apprentice must write a letter to the supervisor covering the work done and offering a criticism of shop methods when he can suggest some remedy. In each branch he must, in these letters, answer 150 questions bearing on the work.

Practical Knowledge the Result

While it is planned to be and considered a very difficult course, more than 80 per cent starting it complete it. It is advocated as providing the essential experience in the departments other than the one where experience through apprenticeship had already been gained. Thus, two months in the boilershop does not make a boilermaker, but it does provide knowledge essential to the future roundhouse or shop foreman.

To justify the apprentice system, the following figures were presented by the supervisor: 72 per cent of those graduated were still with the company; and 15 per cent had been appointed to some position of responsibility. For six years no mechanics have been employed other than through the apprentice route.

Apprentice wages are about one-third of journeymen's rates, while they produce about 75 per cent, on an average, of the amount accomplished by the adult workman. Much of the apparent profit, however, is absorbed in the increased and higher grade supervision, as well as in the somewhat greater amount of spoiled work, broken machinery, and general inconvenience attending the utilization of apprentices. The real profit comes through the building up of a superior group of responsible mechanics.

The Grinding Machine in the Railroad Shop

Advantages of Grinding for Finishing Parts to Size—Grinding Operations on Locomotive Parts—Increasing Efficiency of Motion Mechanism

BY FRANK A. STANLEY

ALTHOUGH the cylindrical grinding machine is used extensively in one type or another in the railroad shop toolroom, it has not as yet been adopted for general shop purposes to anything like the degree warranted by its usefulness as a time saving and accurate producer of various classes of work. The importance of the grinding machine as a piece of locomotive shop equipment makes it seem desirable that a brief article be devoted to some of its applications on engine parts. The following illustrations from different shops represent typical operations on cylindrical, internal and surface grinding machines.

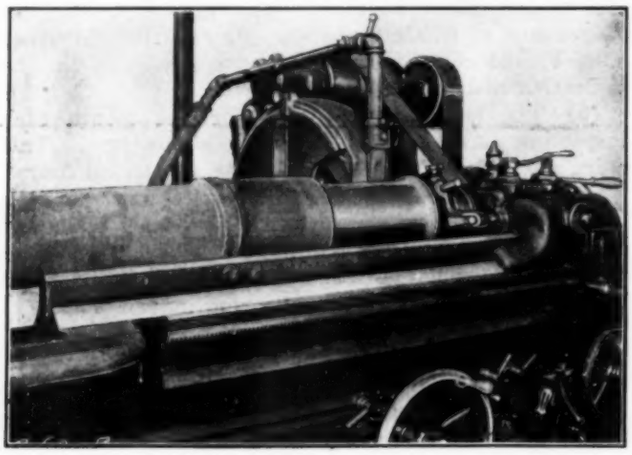
The halftone, Fig. 1, illustrates the grinding of an axle journal. Here the grinding wheel may be run across the straight portion of the journal and with suitable rounded corners on the wheel the fillets at the shoulders may be finished at the same time.

In grinding axles for wheel fits, the allowances for pressing on the wheels may be held to very close limits of accuracy. This is a marked advantage in that with a known diameter of wheel-bore, an exact allowance may be left in grinding the axle fit so that the axle will force into the wheel with the total pressure between the desired minimum and maximum figures. The same thing applies to crankpins and other press fits.

In Fig. 2 is illustrated the method of grinding a crankpin on a Norton plain grinding machine. This pin is 21 in. long and its diameters, of which there are four, run from 5 to 7 in. at the large end.

Ordinarily where such work is ground, it is unnecessary to hold the lathe turning operations closely to size or to give a particularly smooth finish with the lathe tool. The grinding wheel works satisfactorily on a roughly turned surface or even on a surface not turned at all. An allowance may be left in turning for removal by grinding amounting to $\frac{3}{32}$ in. or more under suitable conditions, and often this is exceeded. In other words the turning may be done very economically where the finishing is to be accomplished on the grinding machine, and once suitable allowances are established for removal by the abrasive wheel, the combination of lathe and grinding machine can be used most effectively.

Common practice with pins, axle journals, pistons and the like is to use a roller burnishing tool for finish-



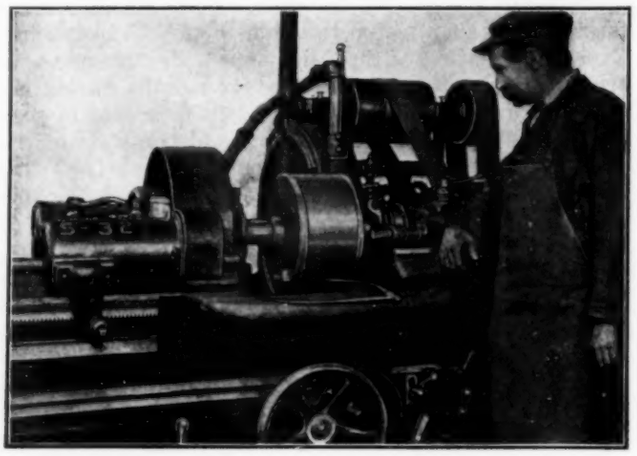
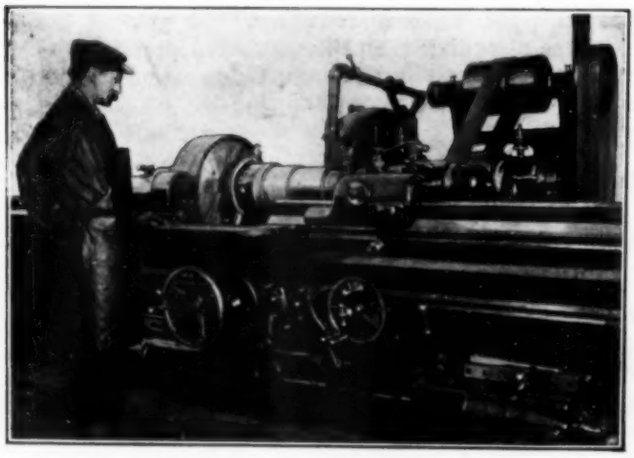


FIG. 1. FINISHING AN AXLE JOURNAL. FIG. 3. GRINDING PISTON RINGS



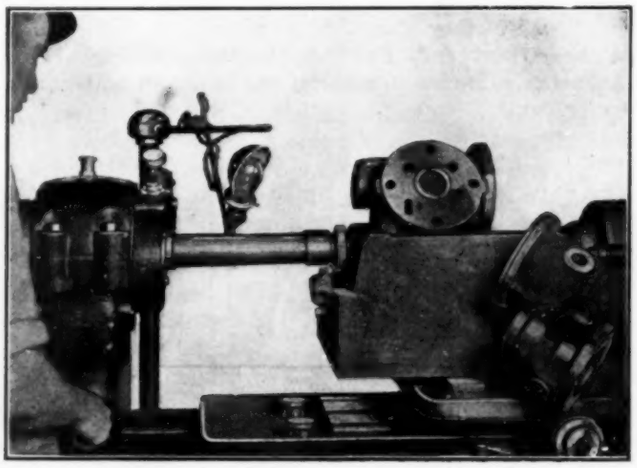


FIG. 2. GRINDING A CRANKPIN. FIG. 4. USING AN INTERNAL GRINDING MACHINE ON AIR BRAKE WORK

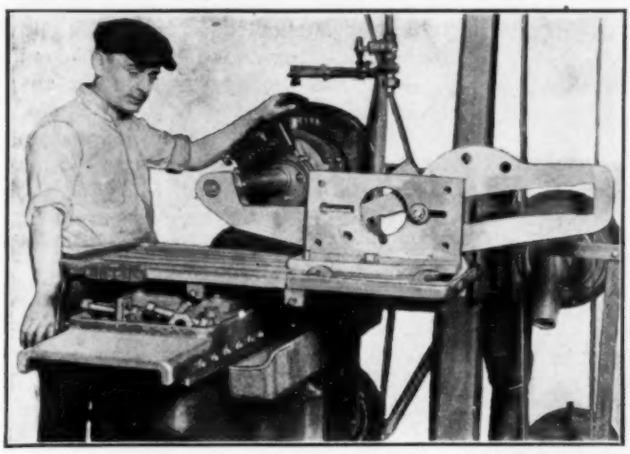


FIG. 5. THE INTERNAL GRINDING MACHINE ON LINK WORK

ing the surface, being adjudged by some authorities to be the best method of providing the desired finish and surface conditions for such work. It is maintained that the character of the surface thus produced is preferable for operating conditions, as a highly polished, tough surface is rolled down on the work, assuring smooth operation and long resistance to wear. On the other hand, even though the first condition of a crankpin, say, may have advantages due to rolling, the original surface is worn down in due course and when the job comes into the shop for re-turning it is usually impossible to refinish the pin except by the customary method of applying a crankpin turning device which does not ordinarily make use of a roll finish.

Rolling is necessarily somewhat slow, as the speed and feed must be within moderate limits. It is further maintained by advocates of grinding that any inequalities of the metal in the work, whether soft spots or extra hard portions, will cause the roller to sink into or ride over such places with corresponding irregularities in the finished piece.

The fact of the matter is that once a grinding machine is installed in a railroad shop, there are a multitude of jobs found that come naturally to the grinding machine, and even aside from pins, axles and the like, the machine is likely to be kept busy most of the time.

Another operation on the grinding machine, that of grinding piston valve rings, is shown in Fig. 3. The rings are held, a number at a time, on a special form of arbor made with two end flanges which, when the rings are centered over the fixture, are tightened by nuts on the through bolts in the flanges to draw them snugly against the rings and hold them for the grinding of the outer circumference.

This method of finishing rings gives uniform accuracy in the ring surfaces, making them clean, smooth and interchangeable. In some shops the rings are being finished on the sides or edges by surface grinding, an operation which is described at another point in this article.

A number of operations as done in different shops on the Heald internal grinding machine are illustrated in the halftones which immediately follow. Thus Fig. 4 shows a grinding operation on an air brake part, using the Heald machine. The operation shown is that of finishing the hole in the bronze bushing which is pressed into the equalizing cylinder used in connection with air brakes. The diameter of the hole is 3½ in., the length 1½ in., the metal removed from the bore, 0.003 in.

A special holding fixture is here used with a pneumatic clamp. The production is over 100 pieces in 10 hours.

The grinding out of a small hole in the radius rod for the valve gear is also done on this machine, an extension quill being applied for the small wheel. The work is strapped against the face of a knee on the grinder table and the overhanging end of the long bar is supported by a chain. The hole is ground dead true with

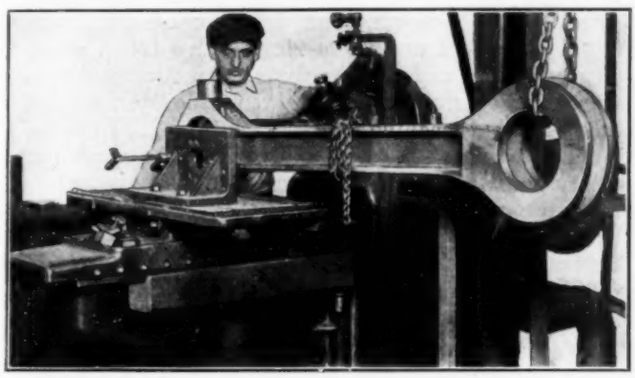


FIG. 6. TRUING UP A HOLE IN A SIDE ROD.

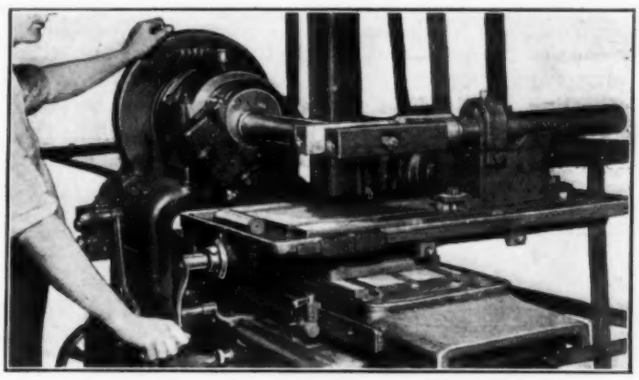


FIG. 8. ANOTHER INTERNAL GRINDING JOB

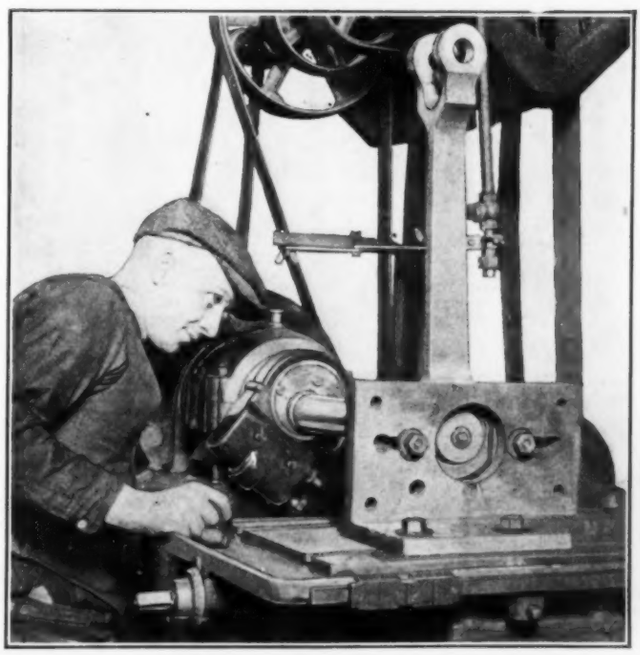


FIG. 7. GRINDING THE BUSHING END OF A VALVE-GEAR LINK

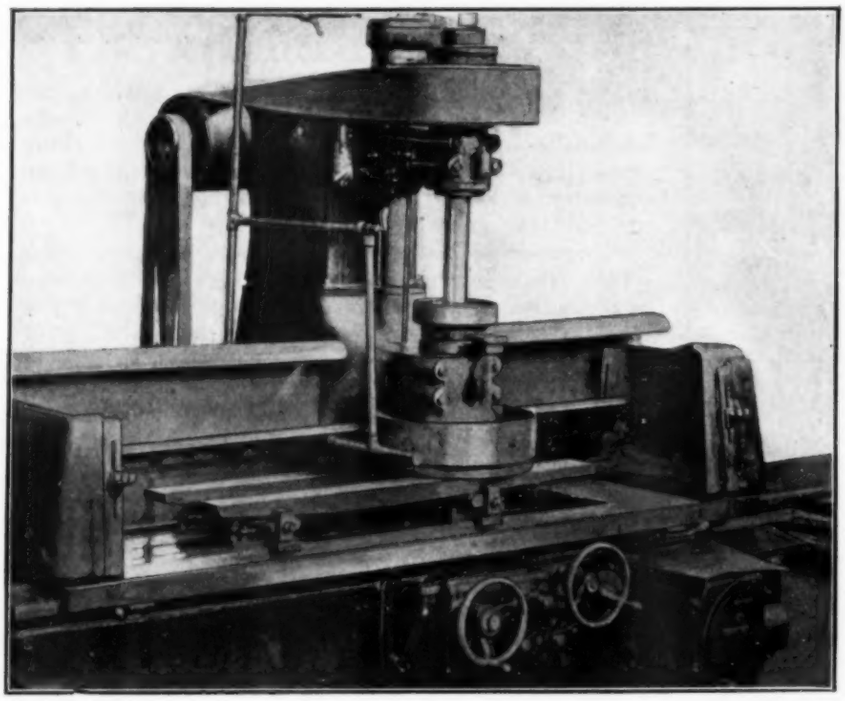


FIG. 9. FINISHING GUIDES ON A SURFACE-GRINDING MACHINE

the face of the work and is held to size by testing with a plug gage.

The link in Fig. 5 is secured by straps and bolts to the face of the angle plate on the grinder table while the hole in the hardened bushing is ground out to diameter. This assures a perfectly true and square job.

FIG. 10. FINISHING CRANKPIN WASHERS ON A VERTICAL SURFACE GRINDER

A side rod is shown in Fig. 6 clamped in the same way to the knee on the table and supported at the outer end by a chain sling as indicated. The old bushing has been pressed out of the rod, and before pressing in a new bushing the hole in the rod is trued up by the internal grinding process. This gives a true cylindrical hole for the new bushing and assures a perfect fit, thus giving added life in service to the bushing.

The work in Fig. 7 is one of the members of a Walschaert valve gear and the job is the grinding out of the bushing end of the rod. This operation gives a straight round hole and provides for a perfect pin bearing, thus increasing the period of operation on the road before overhauling.

Another internal grinding operation on motion work is shown in Fig. 8. Here the work is held in a V-block and the small hole ground with a wheel used with a special extension that is provided for small diameters of work.

The surface grinding machine is used in various railroad shops for such work as the finishing of side rods, slide valves, piston and valve rings, valve faces, crosshead guide bars, and similar parts. An illustration of an operation on guides on a Pratt & Whitney vertical spindle grinding machine is presented in Fig. 9. Special fixtures are applied to the table to hold the work and two bars are carried at once under the wheel, which is sufficiently large in diameter to cover the bearing faces of both bars.

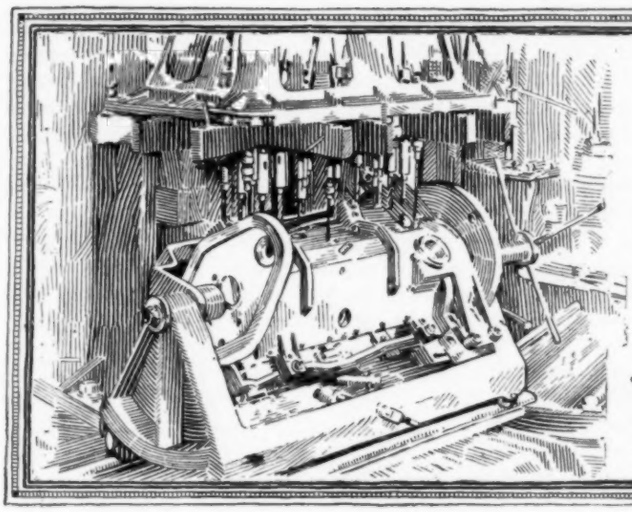
Various other parts can be economically surface ground upon the same machine. Slide valves can be ground to clean parallel on this machine at the rate of five per hour, the width of the casting being 12½ in. Piston rings 10 in. in diameter are ground on the face on the rotary table at the rate of 30 per hour. The ring is held to $\frac{3}{8}$ in. or 0.003 inch.

A Blanchard surface grinding machine is shown in Fig. 10, grinding the faces of washers for driving wheel crankpins. This view shows in the foreground a number of piston rings ready for surface grinding of the sides to thickness. The work on the table is held by the magnetic chuck and revolves with the table under the wheel. The wheel spindle and table are electrically driven.

In cutting off the rings in the vertical boring mill, the tools are so spaced in their holding blocks as to leave the ring $\frac{1}{64}$ in. over thickness and this amount is removed in the surface grinding machine.

Siam Can Use Steel Plows

There is an excellent opportunity for the introduction of modern steel plows into Siam for use in preparing rice lands, according to a report from James P. Davis, consul at Bangkok. Rice growing is the greatest industry of the country, furnishing the food staple for the entire population and 1,000,000 tons or more annually for export. The primitive wooden plow is still being used in most places for preparing the soil for this immense crop.



Tool Engineering

By

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Boring Tools for Turret Lathe Use—Working Conditions—Principles of Boring—Position and Shape of Cutting Tools—Fastening of Tools in Holders

TRUE boring is a generating operation in which a single-point tool revolves about a center in alignment with the hole to be bored. In turret lathe work the tool does not revolve but the work does, which produces a similar effect. If it were possible to support both tool and work so that each were absolutely rigid and without spring, the hole produced would be perfectly true and of exact size as determined by the distance from the center to the cutting point of the boring tool. There is more or less spring to the tool and possibly a small amount in the work itself, so that bored sizes in production work are likely to vary a trifle, making it necessary to depend on a reamer for sizing the hole.

A point of importance in boring is the fact that a generated hole is true and concentric with the center of rotation of the work. A bored hole generated by a single-point tool is the first step in the accurate sizing of a concentric hole. A boring tool is often preceded by a twist drill, core drill, or cutter head, these being used to remove stock preparatory to the boring operation.

The method used in boring is determined to a great extent by the shape of the hole in its rough state. A number of conditions are encountered, and each may require a slightly different method in order to produce a hole which will be true and concentric. Fig. 299 illustrates a number of these conditions found in castings and forgings. The example *A* illustrates a short, straight cored hole of small diameter; *B* is a long straight cored hole. The holes *A* and *B* both extend entirely through the casting, but in the example *C* is a "blind" hole, which does not run entirely through.

The treatment in boring these three castings would be considerably different. In the first case *A* a short and rigid boring tool could be used and good results obtained. In the case *B*, a much longer tool would be required, and several cuts would undoubtedly be necessary in order to produce an accurate hole. If the holes *A* and *B* are approximately 1 in. in diameter when finished, the cored hole would probably be about $\frac{13}{16}$ to $\frac{7}{8}$ in. in diameter. Therefore, it would be possible to use a boring bar with a pilot which would give sufficient support to obviate excessive spring in the tool. If the hole is much smaller than the size mentioned, it would be difficult to use a piloted tool, hence the operation of boring would be slower and less accurate. In the case *C* the hole is "blind," so that no pilot can be used and the work must necessarily be produced by an unsupported tool.

In the example *D* the hole is cored and cylindrical, and there is a pocket at *E* on one side of the casting. This condition is frequently found where the boring operation is an interrupted cut. This intermittent pressure on the tool is severe, and both bar and tool should be made heavy enough to withstand the sudden strains.

In the example *F* there are two holes to be bored at *G* and *H*, and the difference in the finished diameters is only $\frac{1}{32}$ in. If this is a cored hole arranged to be bored with a boring bar having two cutters, the first cutter will have to bore the entire distance through the piece, as the difference in diameters is so slight. The second tool, which bores the diameter *H* will really be a finishing tool, as it will not be required to encounter the scale on the inside of the cored hole. The first tool, therefore, will naturally wear much faster than the second, and as its service is much more severe it should be proportioned accordingly.

In the example *K*, three diameters are to be bored at *L*, *M* and *N*, and the portion *O* must be finished to a large radius. A bar having multiple cutters would be needed for this work, but the mistake should not be made of using a "round-nose" tool for the roughing cut at *O*. Round-nose tools for boring cuts require considerably more power, as they come in contact with more surface and remove a wider chip.

The example shown at *P* is a large diameter which must be bored concentric with the hole *Q* and the recess *R*. Surfaces of this kind are usually handled by a boring bar in combination with a cutter head. The example *S* is a piece of work of large diameter having four shallow concentric holes, *T*, *U*, *V* and *W*. Holes of this variety can also be most conveniently handled by means of a combination of a bar and cutter head.

The example *X* is a combination of a straight and a taper hole. There are two ways of machining work

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For the authors' forthcoming book. All rights reserved.

of this kind: The straight hole can be bored with a piloted bar, and the tapered portion roughed and finished by means of taper stepped reamers; or, both straight and taper holes can be bored with single-point tools, the taper being generated by a special taper-boring tool. The example *Y* is a plain tapered hole, while that at *Z* is a tapered hole relieved by a cored portion as indicated. Tapered holes require special treatment, which will be taken up later.

Cored holes which are to be bored and reamed are seldom machined properly. A cored hole will not usually run true if the work is held by the outside diameter, unless it is indicated and trued up. When there is only one casting to be machined this method can be used, but in quantity production it is neither practical nor desirable.

In Fig. 300 is shown in diagrammatic from both correct and incorrect methods of generating a hole by

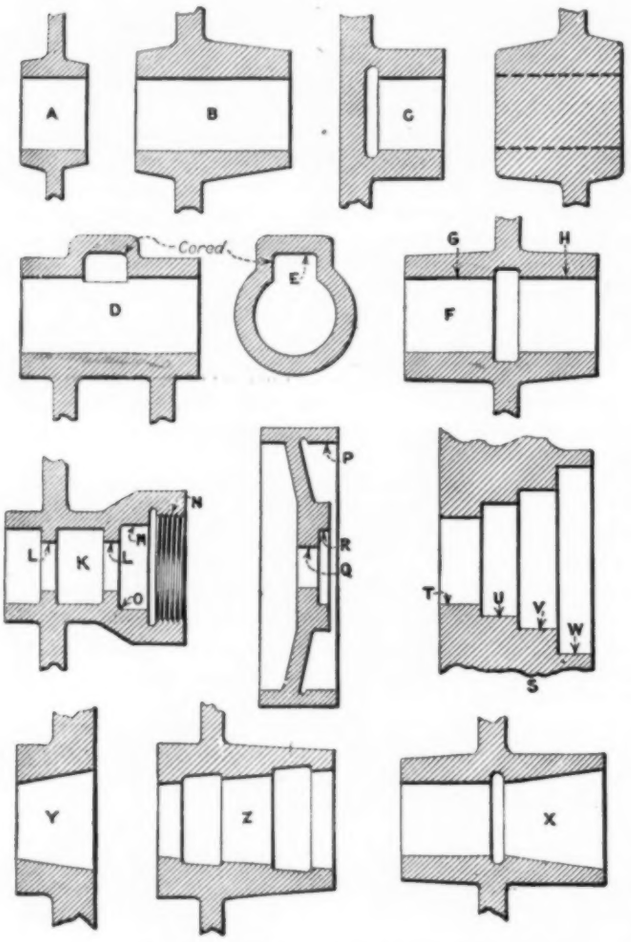


FIG. 299. EXAMPLES OF WORK REQUIRING BORING OPERATIONS

means of boring. In the example, the hole *A* is cored, and will therefore doubtless run out of true slightly when the work is set up on the machine. The core drill *B*, if used first, will naturally follow the cored hole and produce a finished hole which is eccentric to the center of rotation to some extent at least. If the next tool used is a boring tool *C*, it will naturally follow the previous hole, but will cut more on one side than on the other, thus tending to true up the hole. The result here will be a round hole slightly eccentric. In finishing the work by the use of a reamer, this tool will undoubtedly follow the bored hole, so that the completed work will be untrue and slightly eccentric. The amount of eccentricity will depend to a great extent upon how nearly the original cored hole runs true with the outside of the work. Many shops use this method and are, therefore, obliged to true up work after the operation.

Work done in this way is started incorrectly, and as a consequence the final hole is inaccurate. It is just as easy to do it right as it is to do it wrong, and a correct principle will lead to gratifying results. The correct method of sizing a hole of this sort is shown

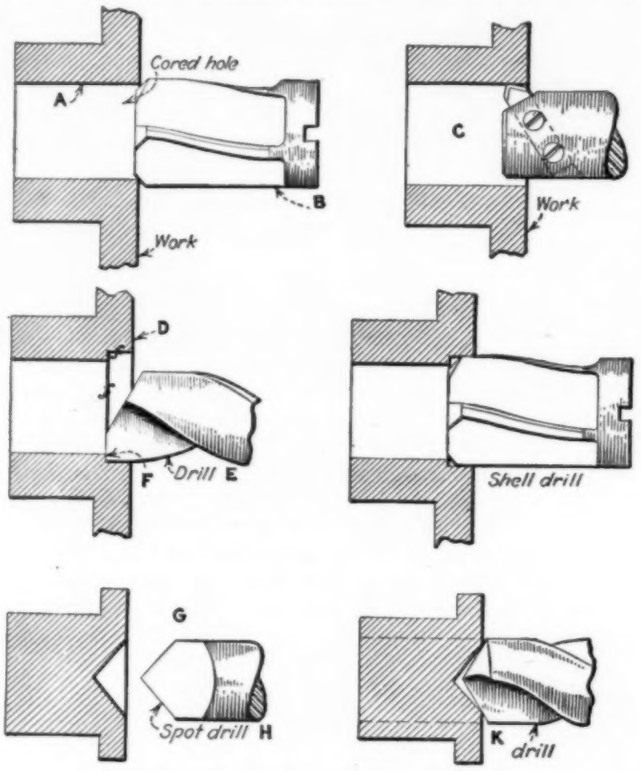


FIG. 300. METHODS OF BORING A HOLE

at *D*. The first tool *E* may be a short twist drill ground away for clearance and made square on one lip. The size of this drill should be a few thousands of an inch smaller than the core drill which is to be used. If the hole is generated a short distance so that it appears as shown at *F*, this portion will undoubtedly be true with the center of rotation of the work. The core drill, or shell drill, can then be used, and as it is started accurately, it will not be likely to run out of true to a great extent while passing through the work, and is not influenced greatly by the eccentricity of the core. By following this tool with a boring tool, the hole is trued up by a generating action, so that the final floating reamer will produce a true and concentric hole.

In the example *G* the work is a solid forging which is to be drilled, bored and reamed to size. Work of this kind should be spotted with a short, rigid spotting tool similar to that shown at *H*. This tool produces a true center in the work, so that it can be followed by a standard twist drill like that shown at *K*. The angle of the spotting drill should be slightly greater than that of the twist drill, so that the lips of the latter will start to cut first in the hole as shown in the example *L*. The drill will then start true, and the cutting will be much better. After the hole is drilled, it may

be followed by a boring tool and reamer, as in the preceding example.

The shape and position of the boring tools are both important factors in the generation of a true hole. Fig. 301 shows a cored hole *A*, which is to be bored by the tool *B*. The hole is blind so that no pilot can be used, and the bar will therefore be more or less flexible, depending upon the size and depth of the hole. If the tool is made so that the nose or cutting point is shaped as shown at *C*, the flexibility of the bar and the angle of the tool will tend to make it deflect and to take a position as shown exaggerated at *D*. This action is caused by the tool not getting under the "scale," but riding upon it, as indicated. The tool will be dulled very rapidly by the abrasive action of the scale, and the results will be very unsatisfactory.

In designing a boring tool for a hole of this kind, the cutting point of the tool should be shaped as shown

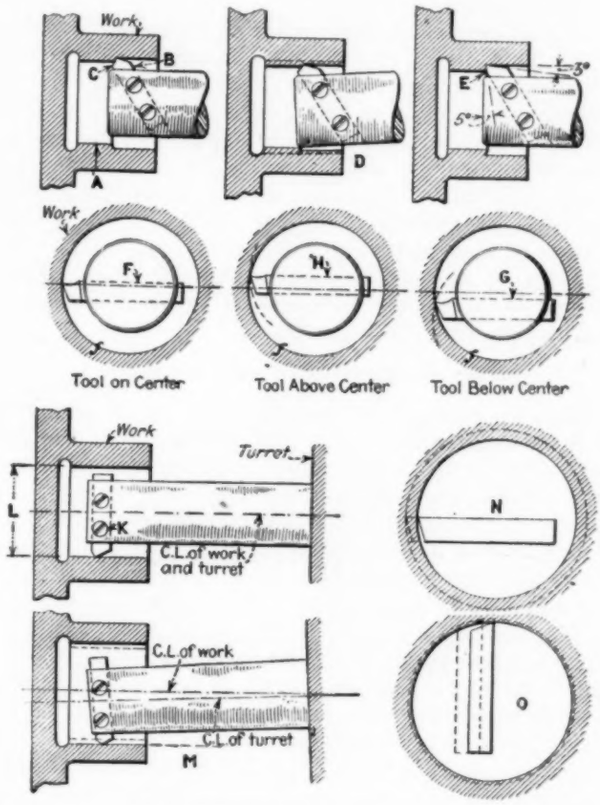


FIG. 301. TOOL POSITIONS IN BORING OPERATIONS

at *E*. When made in this way there is no tendency for the tool to ride on the scale; and it will therefore keep the position indicated, will not dull up rapidly nor deflect, and consequently will produce a much better hole. When piloted bars are used, it is not necessary to take as much care to avoid a condition of this kind, because the bar is supported and cannot deflect. The point of the boring tool should be as blunt as possible, and still retain a sufficient cutting edge. The metal should be allowed to remain behind the cutting point and should not be ground away any more than is necessary for clearance. Generous sizes of tools with plenty of metal at the cutting point carry away heat more rapidly and stand up better for production work.

A point of importance is the position of the tool with respect to the center of the work. If placed directly on center, as shown at *F*, any slight deflection of the tool causes it to dig into the work. If placed a trifle below center, as shown at *G*, this action is still more apparent. If placed slightly above center as shown at *H*, any deflection caused by the pressure of the cut does not tend to throw the tool into the work. Hence, there is no chance for chatter from this cause. Boring tools are usually placed directly on center; but it is better to position them a very small amount above it, say, from $\frac{1}{32}$ to $\frac{1}{16}$ in., depending somewhat on the diameter of the work being bored. This practice is not universally followed, but it will be found an advantage.

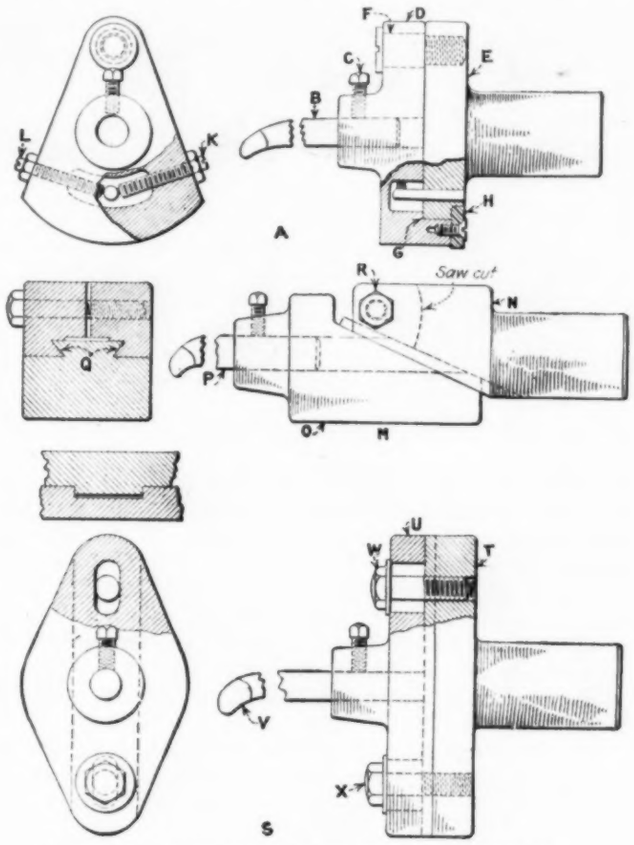


FIG. 302. ADJUSTABLE BORING TOOLHOLDERS

Another point of importance is the position of the tool in a horizontal or vertical plane. The turret does not always index exactly the same, and any variation in the index position is mulitiplied at the end of a long bar. If the tool is placed in a horizontal plane, as shown at *K*, the diameter of the hole *L* will theoretically be produced to a size corresponding with the amount of fluctuation in the position of the bar. Errors in indexing when the tool is placed in this position will frequently cause a variation in the work of from 0.005 to 0.010 in. This point is clearly brought out by the diagram at *M*.

The end view at *N* indicates the variations in diameter which would be caused if the tool were set in a horizontal plane and if the turret did not index correctly. The dotted lines show the size of hole which would be produced under these conditions. It is much better to place the tools in a vertical position as shown at *O*. When they are so placed the cutter variation caused by errors in the indexing may be considerable, and yet the diameter will be changed only a small amount, as indicated by the dotted lines.

It is often desirable to use an adjustable holder for

a boring tool which is required on small work. The principal use of holders of this kind is for automatic screw machine work, or for any other kind of work

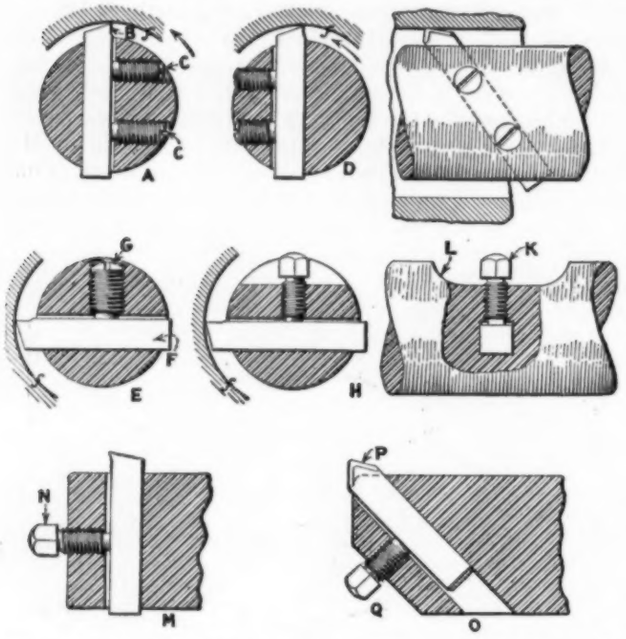


FIG. 303. HOLDING ROUND OR SQUARE BORING TOOLS

in which a forged boring tool not adjustable in itself is used. Several examples of holders for this purpose are shown in Fig. 302. The example at *A* shows a forged tool *B* held by means of a setscrew *C* in a movable member *D*. This member is fastened to a holder *E* which fits the turret of the machine. The member *D* is pivoted on a shouldered screw *F*, so that it can be adjusted to either side of the center line of the turret. It is fitted at *G* and gibbed at *H*, so that there is no lost motion.

In adjusting the tool *B*, the setscrews at *K* and *L* are operated to throw the tool to one side or the other of the center, as many be required. The tool itself

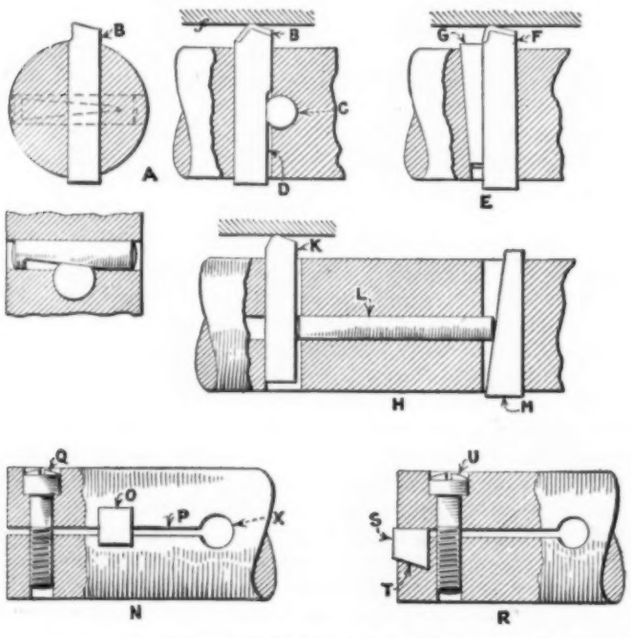


FIG. 304. OTHER METHODS OF HOLDING TOOLS

may be held in a vertical or horizontal position, and it is easily possible to adjust it for varying diameters within its capacity. This design is manufactured in more or less modified form by several machine tool builders specializing in turret lathe work. It would be easily possible to use this holder on the cross-slide of an engine lathe or even in the tailstock by providing a suitable bracket or a taper shank.

Another type of adjustable holder is shown at *M*. It is somewhat out of the ordinary in general design. The shank *N* is designed to fit the turret of the machine and is dovetailed, as shown in the sectional view. The holder *O* contains the tool *P*, which is held by the setscrew as indicated. The dovetailed portion *Q* fits the dovetail in the holder, and adjustments are made by sliding it backward or forward along the taper. When the desired position has been reached the screw *R* is tightened, thus holding the tool firmly. The end of the shank is slotted as indicated, in order to provide for the binding action.

Another type of adjustable boring toolholder is shown at *S*. This device consists of a holder *T* on which is mounted a member *U*, fitted to slide vertically on the holder. The tool *V* is held in the usual manner by a setscrew, and adjustments are made by sliding the movable member up and down, and then tightening the screws at *W* and *X* when the desired position has been reached. In general it is not necessary to provide holders of this sort with very much adjustment when they are to be used for screw machine work. From $\frac{1}{16}$ to $\frac{1}{8}$ in. is usually sufficient, although more can be provided to suit special cases.

Fastening Tools in Holders

Tools for boring bars may be either round or square. If made from round stock they ordinarily fit the hole easily; while if square, bright, drawn stock is used, they do not generally fit closely, but are more or less loose. For a factory using a comparatively small number of boring bars in its production work, the round shape is to be preferred, because it is easier to make a round hole in a bar than it is to make one which is rectangular or square. Square tools have some advantages over those of a round section, but if they are to be adopted as a standard a set of broaches of various sizes must be made up, so that the holes can be put in the bars cleanly and without trouble.

Tools are held in boring bars in various ways, depending upon the type of cutter, its size and general shape. The essential points in holding are rigidity and convenience of adjustment. The thrust of the cut is to be taken against the solid portion of the bar; but in actual practice convenience often requires the setscrews be placed in such a way that the thrust comes against the screws themselves.

In Fig. 303 is shown a sectional view of a boring bar at *A*. The tool *B* is so placed in the bar that the cutting edge is in line with the center of the bar. The tool is held in place by two setscrews, shown at *C*. The thrust of the cut is in the direction indicated by the arrows, but if this bar were to be used on turret lathe work, the screws placed as shown would be at the rear of the machine, and the operator would not find it convenient to adjust them without going around behind the machine. In the example *D* the setscrews take the thrust of the cut, but if they are substantially made there will be no difficulty in this respect and the oper-

ator will find it much more convenient to make adjustments.

Incidentally, it may be stated that small setscrews with slotted heads should not be used for holding the cutter, because it is difficult to set them up tight enough to hold it, and also because the slots are apt to be broken or mutilated by long use. A hollow-head setscrew will be found an advantage in holding cutters and boring bars. If there is plenty of room, it is not objectionable to use a square-head setscrew. In the example shown at *E*, the tool *F* is held by a single screw *G*, but this method should be avoided and two screws used whenever possible. In the example *H* a square-head setscrew *K* is used. The bar is cut away at *L*, so that the setscrew will not project beyond the outside diameter of the bar.

A cutter which is placed close to the end of a boring bar may often be held as shown at *M*, when the bar is not piloted. The setscrew *N* is placed in the end of the bar as indicated. If the size will permit, it is better to use two screws. Many cases are found when the cutter must project beyond the end of the bar itself. An example of this kind is shown at *O*, in which the tool *P* projects slightly. The method of holding in this case is by means of a setscrew *Q*, although here also two screws would undoubtedly be an advantage.

In holding tools in small bars or when space is limited, other means must be provided. Several examples of this kind are shown in Fig. 304. One of the best known of these methods is shown at *A*, in which the tool *B* is held in place by a straight pin *C*, one side of which has been milled to a taper. The tool is flatted at *D*, and the pin driven firmly into place against this flat. This method is used to a great extent in holding many kinds of cutters. The principal objection to its use is the difficulty of adjustment.

The method shown at *E* is very objectionable. Here the tool *F* is held in place by means of a wedge *G*. It is practically impossible to set a tool of this kind to a given diameter and hold it firmly, because the wedge *G* when set up always carries the cutter with it slightly, thus changing the setting. Another method employing the wedge principle is shown at *H*. In this case the tool *K* is clamped by means of the steel rod *L*, which is acted upon by the wedge *M*. There are certain cases where some arrangement of this sort may be found necessary.

Another method of holding a rectangular tool is shown at *N*. The tool *O* is close to the end of the bar and is of rectangular shape, as shown. The bar is slotted at *P*, and the screw *Q* is used as a pinch binder to draw the sides of the bar together, thus holding the tool securely. This arrangement may also be found very convenient at times. It is advisable to make the hole *X* of fairly large size in order to help the spring action.

In the example *R* the tool *S* is held so that it projects a trifle beyond the end of the bar. The tool is shaped so that it has a slight angle at *T* which fits a corresponding slot across the bar. As in the preceding case, the bar is slotted to allow for a pinch-binder screw at *U*. The advantage of this type is that the tool can be securely held either straight or at an angle, and also so that the cutting edge is at the end of the bar.

Specifications for Brass and Bronze Gears

The American Gear Manufacturers Association recommends the following specifications for brass and bronze gears:

For spur and bevel gears, hard cast bronze, S. A. E. No. 62 of the well known 88-10-2 mixture to the following limits:

Copper	86 to 89 per cent
Tin	9 to 11 per cent
Zinc	1 to 3 per cent
Lead, max.	0.20 per cent
Iron, max.	0.06 per cent

Good castings made from this bronze should give the following minimum physical characteristics:

Ultimate strength	30,000 lb. per square inch
Yield point	15,000 lb. per square inch
Elongation in 2 in.	14 per cent

For bronze worm gears, two alternative analyses of phosphor bronze, both S. A. E. specifications, Nos. 65 and 63, are recommended.

S. A. E. No. 65, Called Phosphor Gear Bronze

Copper	88 to 90 per cent
Tin	10 to 12 per cent
Phos.	1 to 3 per cent
Lead, zinc and other impurities, max.	5 per cent

Good castings made of this alloy should give the following minimum characteristics:

Ultimate strength	35,000 lb. per square inch
Yield point	20,000 lb. per square inch
Elongation in 2 in.	10 per cent

S. A. E. No. 63, Called Leaded Gun Metal

Copper	86 to 89 per cent
Tin	9 to 11 per cent
Lead	1 to 2.5 per cent
Phos., max.	0.25 per cent
Zinc and impurities, max.	0.50 per cent

The following minimum physical characteristics may be expected from good castings:

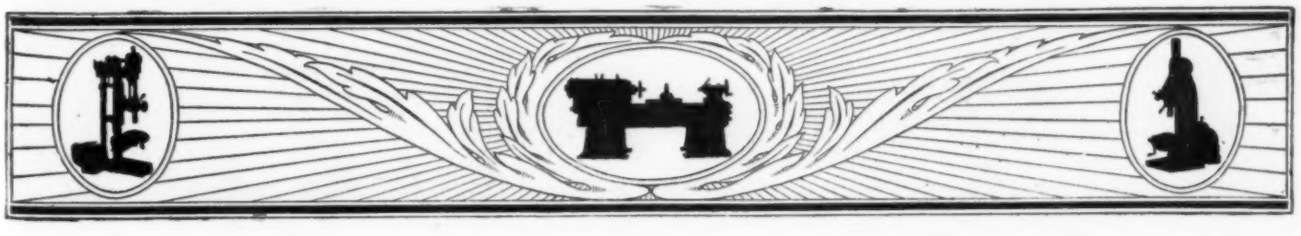
Ultimate strength	30,000 lb. per square inch
Yield point	12,000 lb. per square inch
Elongation in 2 in.	10 per cent

For bronze bushings the recommended practice is S. A. E. No. 64, a strong phosphor bronze with excellent anti-friction qualities, and capable of sustaining heavy loads and severe usage. The composition is as follows:

Copper	78.5 to 81.5 per cent
Tin	9.0 to 11.0 per cent
Lead	9.0 to 11.0 per cent
Phos.	0.05 to 0.25 per cent
Zinc, max.	0.75 per cent
Other impurities, max.	0.25 per cent

Good castings of this alloy should give the following minimum physical characteristics:

Ultimate strength	25,000 lb. per square inch
Yield point	12,000 lb. per square inch
Elongation in 2 in.	8 per cent



Making a Casehardened Crankshaft

Some Details of a Method of Heat-Treating Both Main and Crankpin Bearings To Give Them an Extremely Long Life

SPECIAL CORRESPONDENCE

THE Franklin Motor Car Co. has, after long tests, made a departure in crankshaft practice being, so far as the writer knows, the only builder of passenger cars to caseharden or carburize the crankshaft. The object, of course, is to secure a harder and better wearing surface for the main and crankpin bearings. Tests show the wear to be reduced from one-third to one-sixth the amount found in the usual crankshaft. This means putting off the taking up of bearings, with its attendant expense, for a much longer period.

The shafts are rough and finish turned, leaving material for two grinding operations. The parts to be left soft, which means all but the bearings themselves, are copper plated before the crankshaft is packed for carburizing. The bearings are wound with tape to prevent being plated.

The crankshafts are very carefully packed in carburizing material in the boxes shown in Fig. 1 and the covers "luted" or sealed in place with fireclay, Fig. 2, to exclude gases and keep them airtight. The boxes are then handled by the truck shown in Fig. 3, which places them in the furnace where they remain for 24 hours at a temperature of from 1,600 to 1,700 deg. F. The pots last about 450 hours.

After removal, the crankshaft is allowed to cool in the box and is then reheated to 1,450 deg. F., and when removed from the furnace it is placed in the die or "straight jacket" shown in Fig. 4. This keeps the shaft rigidly in line during the quenching process and prevents the springing and distortion which is so apt to occur in a piece of this shape.

Then come two grinding operations to finish the shaft to size (with a straightening process in between), after which it is balanced, both on static and dynamic machines and with the fan and parts attached.

The casehardened shaft presents new problems and means, above all things, extreme care in all the processes.

FIG. 1. PACKING FOR CARBURIZING.

FIG. 2. SEALING THE LID

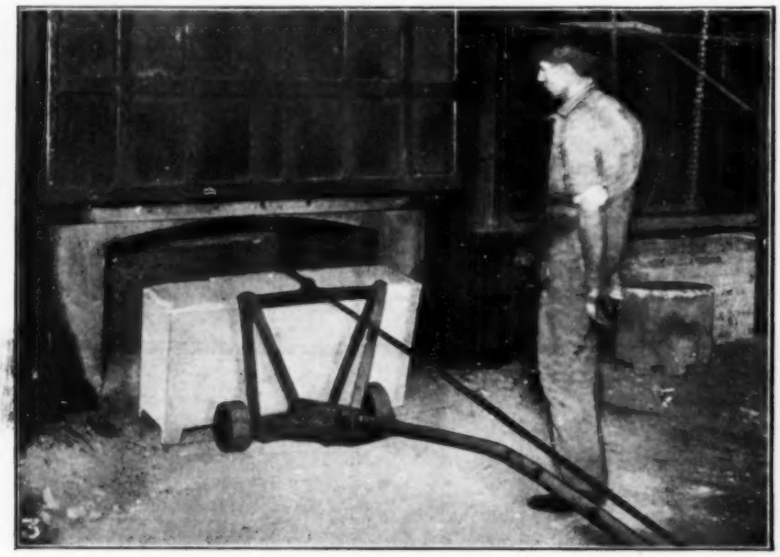


FIG. 3. TRUCKING INTO FURNACE.

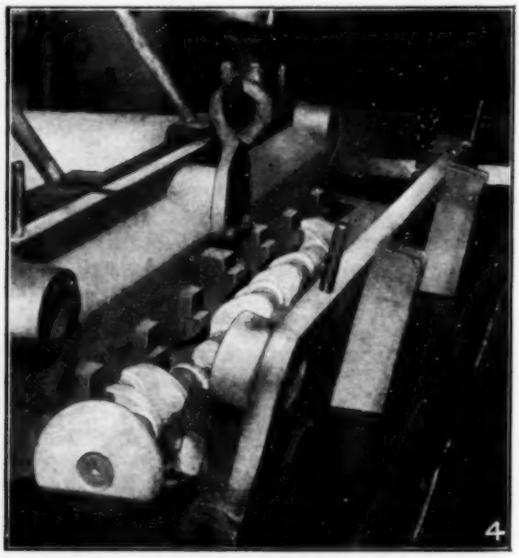


FIG. 4. PREVENTING WARPING IN QUENCHING

Machine Tool Industry May Utilize Its Idle Equipment

Wartime Expansion Makes Industry Seem Overbuilt, but Readjustment Will Bring Demand for More and Better Machine Tools to Lower Production Costs

By FRANK A. SCOTT
Vice-president the Warner & Swasey Co., Cleveland, Ohio

DURING the year 1921 the American machine tool industry, in common with other metal-working industries, has experienced a constantly diminishing volume of business, with curtailment of production, decreases in the number of employees, reduction of wages, limitation of advertising and sales expense, and all the phenomena that accompany a period of depression. It is probable that the industry as a whole operated throughout the year at less than 20 per cent of its productive capacity. It is equally probable that the reductions in wages and salaries in machine-tool organizations averaged 30 per cent. The close of the year finds machine-tool manufacturers with large stocks of finished machines; a somewhat improved market, as compared with the middle of the year, but with a demand for their product still too small to justify continued operation even on a greatly reduced basis.

Most of the American machine-tool companies will show a loss for the year 1921. The financial condition of these companies has been unfavorably affected by the small volume of business and by the necessity for paying during 1921 income tax and excess profits tax on the business of 1920. Therefore, there has been a heavy increase in bank indebtedness throughout the industry during the year. Some concerns have already met the situation by additional financing in the form of bond issues or preferred stock isues, thereby relieving bank indebtedness and acquiring additional working capital to meet the cost of carrying organizations and stocks.

Prices Drop 25 Per Cent

The price trend has been steadily downward, and, although definite data are not yet available, the average reduction will doubtless be shown to have been around 25 per cent. This reduction is based on the probabilities of lessening costs, rather than on any cost represented in present stocks. It is probable that the price recession is now about complete, with only readjustments between different kinds of machines to bring the industry into balance. It is anticipated by manufacturers that reduced costs of materials, together with wage reductions which have already taken place and organization readjustments will offset the lowering in price.

It is probable that the industry has now experienced most of the grief which will fall to its share during the period of readjustment and recession. The majority of the people in the industry are undoubtedly looking forward to improved conditions during the year 1922. In all likelihood the improvement during 1922 will result partly from substantial economies, which have now been enforced, and from temporary utilization of excess plant capacity to produce articles not manufactured by machine-tool builders under ordinary economic conditions. There is already considerable evidence of this tendency.

The American machine-tool industry, prior to the war, led the world in every department; that is to say in design, workmanship, efficiency, and volume of production. The World War was a great stimulus to the industry in at least four of the countries affected; namely, the United States, Great Britain, France, and Germany. Whether this period brought such pressure in England and Germany, as to produce new and better designs than those developed in the United States, still remains problematical. The chances are, that whatever advantage may have been secured by any foreign nation during the war will be regained by the United States during the present depression, for normally it is in such periods of quiet that the industry does its best work in producing new designs of high efficiency.

It was natural that the period of the war should witness unprecedented extension of facilities by machine-tool manufacturers already in existence, and an equally unprecedented development of new concerns, attracted to the field by the prospect of business easily attainable and enticingly profitable. All of the machine-tool manufacturers in the world, in the middle of the year 1918, were unable to meet the demand for the production of weapons and facilities of war.

Immediately following the armistice there was little recession in this demand; but, on the contrary, the needs of the metal-working industries, endeavoring to resume their respective places as producers of "peace time" instead of "war time" products, continued the unprecedented demand upon the machine-tool manufacturer. By May, 1920, it was evident that this demand had been satisfied, and by September, 1920, the machine-tool industry was entering upon such a period of depression as had never theretofore been experienced. From the pinnacle of its greatest success and prosperity it descended during 1921 to the lowest level, contrasting its present productive power with the existing demand, that has been known since the making of machine tools grew large enough in volume to be called an industry.

The older and better established concerns realize that they have nothing to fear from the present discouraging period and are even now confidently predicting the outcome. The products of these manufacturers are known to metal workers in every land and enjoy world-wide distribution. Their designs represent the intelligent development of years of experience, and their plants, for the most part, have been developed from year to year from the earnings of the business. Their organizations are seasoned by years of training in every department through designing, workmanship, production, sales, and administration. On the other hand, the newcomers in the field, with trade names unknown to the general buyer, with products designed during the

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war pressure and unseasoned by years of experience and correction, with profits, wherever made during the war, largely withdrawn from the business to meet war time taxes, face a discouraging future; and that many of them must go the way of other short-lived war time industries can be assumed.

The tendency, however, to reason in the machine-tool industry, that 1913-1914 represents a normal period, and that the present depression is merely "return to the normal," is as baseless as it is in every other field of thought and industry. There is no more possibility of this industry returning to a "before the war condition" than there is of the nations in general returning to such condition. The relationships, the needs, and the demands of mankind have been so changed that we face in every industry, and especially in the machine-tool industry, a future to which past experience is not the key. The future of the machine-tool industry must be based upon the tremendous development in metal production and metal working in every country which has industrial facilities. For example, the new blast furnaces now being erected in India will give a pig-iron production which will double the pre-war production. Similar developments in Japan and China, the increased tonnage which will come from Belgium, the increased tonnage in the United States, England, and France, in pig-iron and other metals, all indicate the need of a much greater machine-tool volume than the world possessed prior to the war. We are in the midst of a metal age, and all the metals known to man might be mined and smelted, but they could not be worked and made available for the uses of civilized man except by the intervention of the machine tool. Even beyond this, the one great lesson which metal industries learned during the war was the efficiency and profitableness of quantity production and, if possible, automatic processes. This knowledge will create a world-wide demand for efficient machine tools such as even the dreamer in the industry dare not now put into words.

The United States is the greatest machine tool market in the world, and the automotive industry of the United States has been the greatest machine-tool customer the industry has ever had. Roughly speaking, it would have been possible prior to the war to approximate the machine-tool demand in any country by observing the pig-iron production of that country. A chart of the pig-iron production has for many years been a fairly accurate gage of machine-tool production. The value of this gage of the industry has temporarily been destroyed by the maladjustments caused by radical and sudden changes in the quantity, uses, and forms of metal products needed to supply the demands of war.

The American machine-tool manufacturers, thus enjoying the greatest market right at their own doors, were naturally the first to develop quantity production of machine tools; and in all machine-tool producing countries except England the tools manufactured were mostly copies of American designs and wherever the volume was sufficient to justify quantity production were manufactured under American methods.

In addition to supplying its own market, the American industry had developed a gratifying volume of foreign trade, as is shown by the following figures:

EXPORTS IMMEDIATELY PRECEDING THE WAR

1909	$3,600,000
1910	9,600,000
1913	16,000,000

(Note: Classified in foreign and domestic commerce reports as "lathes," "other machine tools," "sharpening and grinding machines," and "other metal working machines.")

COMPARISON WITH LARGEST COMPETING NATIONS

	Great Britain		
1909	$3,700,000	1913	$4,900,000
	Germany		
1910	$12,328,000	1913	$19,500,000
	United States		
1909	$3,600,000	1913	$16,000,000

The ascendancy which this shows for American machine-tool exports over the nearest competitors is accounted for by the superior American design fostered by our intensive mass production methods, by quantity production of the tools themselves, and by superior American workmanship. These same factors, by which we were able to defeat our machine-tool export competitors, are not only still in operation but have advanced many fold during the war period. They will therefore continue to operate to our advantage in the future, but in a lessening degree.

GROWTH OF MACHINE TOOL EXPORTS IN THE YEARS 1914 TO 1920

1914	$14,000,000
1915	28,000,000
1916	61,000,000
1917	85,000,000
1918	58,000,000
1919	58,000,000
1920	44,000,000

During the year 1921 the export of machine tools showed a recession greater than the domestic business. This was in part due to the flood of second-hand tools in foreign markets released from war production, to credit maladjustments, to exchange conditions, and to German competition which was especially evident in Scandinavia, Belgium, and the north of France. Also, it must be remembered that Russia, which at one time was one of the best customers for machine tools of both Germany and Great Britain, has been entirely out of the market since the war. German competition throughout Europe will be especially effective until German economic conditions are settled and she is brought into real competition in the cost of her raw materials and production with the rest of the world.

Credit Conditions

The year 1921 was unusually hazardous in all lines of industry. In the machine-tool industry this condition was reflected in a high percentage of undesirable accounts. A fair proportion of sales consisted of regular business with excellent credit risks, but the necessity for securing all available orders in the face of the second-hand machinery market and unrestricted competition forced acceptance of the most hazardous credits of the last ten years.

Further, a substantial portion of the machine-tool sales of 1921 was made to new firms for the manufacture of new products, and, of course, general conditions have made this class of business exceptionally risky.

In spite of these factors the losses in the machine-tool industry during 1921 have been less than in allied lines. The explanation of this may be, first, that the purchase of new equipment is usually carefully considered, with a resulting provision for payment; second, the nature of the product makes it possible to sell hazardous risks under some form of retained title contract, so that the seller is secure until full payment is made. The product, of course, is one which depreciates slowly, and therefore with the proper technical safeguards to title there is little danger of loss even from sales to accounts that are known to be hazardous.

It is obvious that machine-tool manufacture takes its place among fundamental industries essential to modern civilization. Equally obvious are the great and continu-

ing contributions made by the machine-tool designers and manufacturers to American industrial prosperity and advancement. Better machine tools have made possible quantity production and less cost in American metal industries, and low cost has meant a wider market for the product; therefore, we have in the United States such striking examples as our automotive industry, our electrical industry, our plumbing supply and house-equipment industries, our textile industry, our shoe-manufacturing industry, and our great transportation systems, with many others which serve the public cheaply and almost universally because of the efficiency of the machine tools placed at their command. Their service to the people has been increased and their charges for the service decreased in proportion to the improved facilities supplied to them by the machine-tool industry.

Outlook for the Future

In the new industrial era before us competition will again be the ruling force. The industries best served by the machine-tool designers and manufacturers will enjoy the advantage. Machine tools of even five years ago cannot compare with the machines and the expert application of their possible service worked out by the engineering science of today. What of the manufacturers who are going to try to compete with machine tools ten, fifteen, or even twenty years old? They must re-equip, and the sole gage will be the best machine at any price, so long as the cost per piece of the product can thereby be reduced. In the end this will mean greater production, a cheaper product, a better product, and therefore a wider distribution and greater markets.

This, then, is the answer to the charge that there has been overexpansion on the part of the experienced and efficient manufacturers due to the war. The expansion so made will eventually be balanced by the increased world needs also due to the war. These expanded facilities, in our country and in every other machine-tool manufacturing country, which now constitute a considerable embarrassment, are a temporary embarrassment only, and, with readjusted world conditions, will prove but a further vehicle for serving metal-working industries and through them all mankind.

Kinks for the Machine Shop

By R. McHenry

The drawers of a new tool case are apt to stick, and work stiffly. An application of soft grease along the sides and bearing surfaces of the drawers will give that desired velvet smoothness of movement at once.

It is often necessary to round or point the ends of small machine screws, rivets, or headed pins. The usual method of procedure is to start at the grinding wheel and end by searching the floor for the lost piece. A more satisfactory way is to hold the work in a pin-vise with the head back of the jaws, and grasp the handle of the pin-vise in the chuck or collet of the speed lathe. The pointing can then be done neatly with a file and the work will be there after it is done.

After planing, milling, or otherwise machining a bar of cold-rolled steel on one side, the bar will spring to a considerable extent upon being released from the holding vise because of the relieving of the rolling strains. This may be counteracted to a great degree by first heating the bar to a dull red and allowing it to cool in air.

Oftentimes it is desirable to unwind small coil springs and the usual method of using pliers and a hammer for that purpose is unsatisfactory. By gripping one of the free ends of the wire in a vise, inserting a rod of suitable size through the coil and pulling away from the vise by holding the protruding ends of the rod in both hands the wire will unwind smoothly and, though it will not be straight, it will be in a condition to rewind to a different size.

When it is not advisable to use a dog on a small piece of finished work to drive it upon centers in a lathe, a piece of belt lacing may be passed two or three times around the work, knotted, and the free ends run through opposite slots in the faceplate and tied together. This takes up less room than a dog and does not mar the work. It will also drive much more strongly than would be supposed.

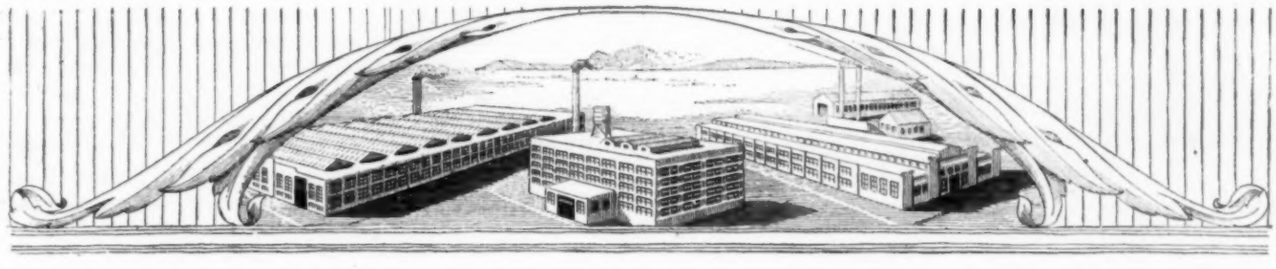
When clamping or strapping work on the planer table or elsewhere and it is necessary to rest the ends of the clamps or straps on a sloping surface, there is a tendency to slip and the work will be held insecurely. If a broken bit of old file be placed under the strap-end it will hold much more securely.

Cutting Oil Grooves

A quick way of cutting smooth and straight oil grooves in the bores of pulleys, bushings, etc., is to turn a round-pointed toolbit flatwise in the boring toolholder and plane the groove by running the lathe carriage back and forth by hand; meanwhile feeding the tool to the cut by means of the cross-slide.

Small pulleys made from hardwood prove very efficient for emergency or experimental work. They should be bored, reamed and turned with as much care as an iron pulley but, owing to the nature of the material, they can be made in a fraction of the time that would be required to make an iron one of the same dimensions. With a suitable keyway cut in the bore they will transmit a surprising amount of power and will last a long time.

It is sometimes desirable to make a "witness" mark on pieces of hardened steel when disassembling a machine to assist in relocating them. An application of copper sulphate solution will leave a neatly coppered surface upon which a temporary mark may be made with a scriber.



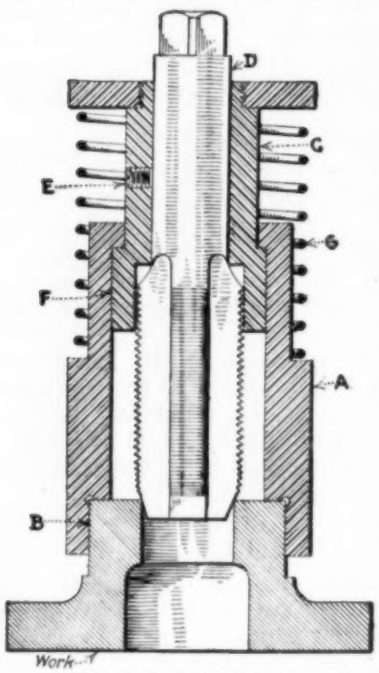
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Simple Fixture for Hand Tapping

By Gene Phelps

The hand tapping fixture shown here was used to tap a hole in a piece of work at a right-angle to the base and also concentric with the hub diameter. As extreme accuracy was required, it was necessary to design a simple fixture which would do away with possible errors often resulting in hand tapping. The sleeve *A* fits over the hub of the work at *B* as shown. The housing *C* is assembled on the tap shank *D* and is held securely by means of a setscrew *E*. The diameter of the bushing acts as a bearing at *F*, thus keeping the tap from starting at an angle. The tap is started into the hole and as it enters the work the compression spring *G* exerts pressure on the sleeve, holding it in proper position on the work. The general construction is very simple.



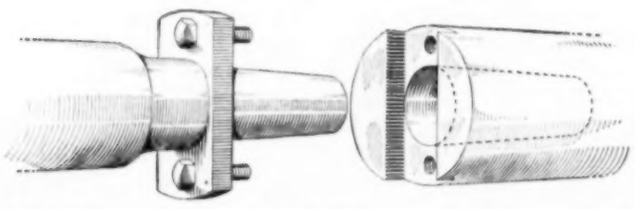
A HAND TAPPING FIXTURE

Holding a Boring Bar in a Radial Drilling Machine

By F. R. Hammond

Being employed in a jobbing shop where there is no boring mill, I have to do occasional boring mill jobs on the radial drilling machine and I have often experienced trouble in keeping the bar in the spindle, as the driving power of the taper shank is not sufficient to drive the cutter on large diameter holes. The bar will wring loose or the tang will be twisted off.

The accompanying sketch will serve to show the manner in which I overcame this difficulty and am now able to bore large holes, giving no thought to the connection between bar and spindle.



HOLDING A BORING BAR IN THE SPINDLE OF A RADIAL DRILLING MACHINE

I first cut out a rectangular slot across the end of the spindle, the width of the slot being equal to the large diameter of the taper hole and its depth being $\frac{3}{8}$ in. At the bottom of the slot two small holes were drilled and tapped into the spindle, one on each side of the taper hole and parallel with the center line.

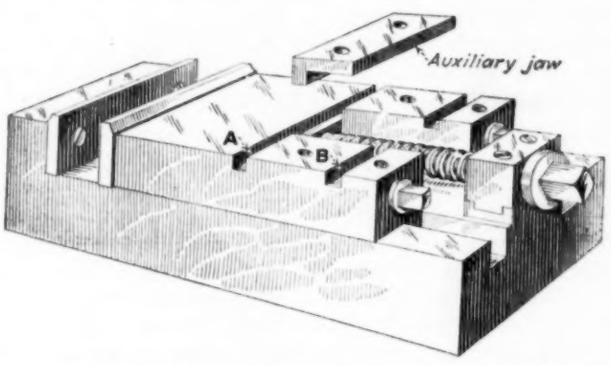
Now when I turn up a new bar I leave a flange, or shoulder, $\frac{3}{8}$-in. thick at the proper place on the shank and then flat it off on two sides in the shaper to a width equal to the width of the slot in the spindle. Holes in this flange for small hexagon head capscrews complete the job.

When the bar is set in place in the spindle the flange enters and fills the slot but does not quite bottom, the shank stopping on the taper. The two capscrews draw the taper to a firm seat and prevent it from working loose while the flange, bearing against the sides of the slot, does the driving.

Increasing the Capacity of a Milling Machine Vise

By Harry R. Holbrook

Having occasion frequently to hold dies and other work larger than $2\frac{3}{4}$ in. wide in a Brown & Sharpe milling machine vise, I milled cross-slots in the top of the slide, as shown in the illustration, and fitted an auxiliary jaw with a tongue to match the slot.



AUXILIARY JAW FOR BROWN & SHARPE MILLING MACHINE VISE

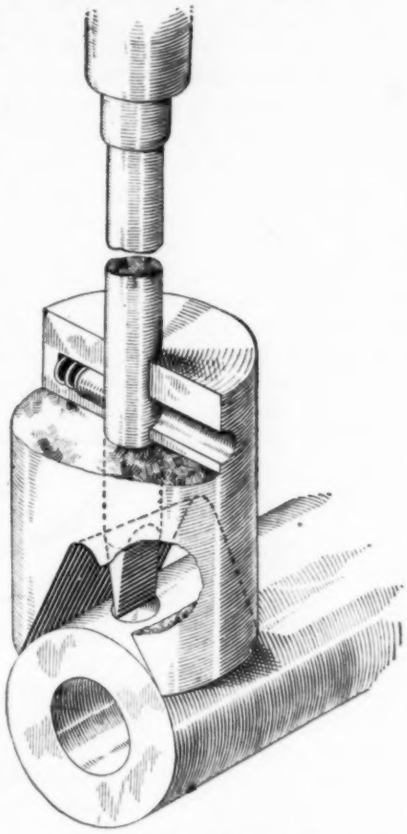
The steel jaw faces upon this vise project $\frac{1}{4}$ in. above the surface of the slide, and therefore when the face is removed from the slide the fixed jaw face presents the necessary surface opposed to the auxiliary jaw and makes a vise $\frac{1}{4}$ in. deep, capable of holding work up to $6\frac{1}{2}$ in. upon the top of the slide.

The first slot should be so spaced that the vise will hold work down to the original capacity, while the other slot should be at the farthest limit.

A Safety Screwdriver for Use Around the Screw Machine

By H. Moore

Many of the toolholders and shanks commonly used in connection with the screw machine are fitted with headless setscrews for the purpose of securing the tool. In using a screwdriver upon these screws, it is liable to slip because of the oil that is always present, and, if the shank is held in the hand at the time, injury to the operator is likely to result. I have made a safety screwdriver as shown in the accompanying sketch that reduces this danger to a minimum. The blade is made from round stock drawn down to the required shape at the end, and a larger round piece is fitted to slide upon it. In one end of this larger piece, or collar, is a deep V-groove that spans the round holder in which is the screw to be loosened. A small spring plunger, fitted as shown in the sketch, provides sufficient pressure to keep the collar from falling off yet allows it to be moved along the round part of the screwdriver blade readily.



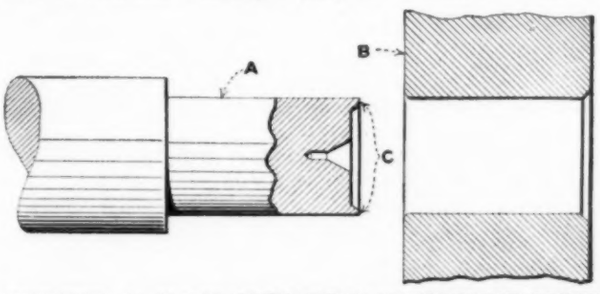
SAFETY SCREWDRIVER

To use the device, the toolholder is held in the hollow of the left hand, the thumb and fingers pressing the V-groove against the holder. This centers the screwdriver and when the slot is once found there is no opportunity for the blade to slip out.

How to Rivet Properly

By Fred C. Bryant

Few machinists know the quickest way to rivet a shaft neatly into a solid body, or a punch into it's holder, without causing injury to the center hole, so I have prepared this sketch and description for their benefit. *A* represents a shaft to be riveted into the solid body *B*. The shaft should be turned about $\frac{1}{64}$ in. longer than the thickness of the piece into which it is to be riveted and should be slightly undercut from the center hole to within about $\frac{1}{32}$ in. of the outer edge, depending on the size of the stock. *B* is then placed over *A* and the resultant edge *C* peened over.



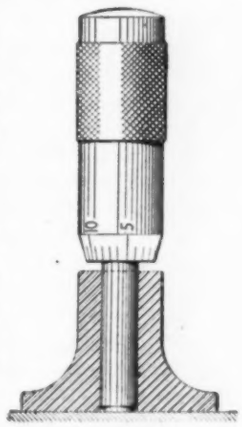
RIVETING A SHANK WITHOUT DAMAGING THE CENTER

Quick Method of Refinishing the Measuring Surfaces of Micrometers

By Charles Reimschissel

A quick way to true the measuring surfaces of micrometer anvils and spindles is shown in the accompanying sketch.

A bushing of cast iron is bored to a neat fit on the spindle, and faced accurately square with it. Three round laps about $\frac{3}{4}$ in. in diameter are made of cast iron or very soft steel. The first of these laps may be of any convenient thickness, with the others varying by increments of 0.008 in. These laps should be charged, *on one side only*, with diamond dust.



REFINISHING MEASURING SURFACES OF MICROMETERS

With the spindle removed from the instrument and inserted in the bushing, the combined surfaces may be lapped on any convenient lapping plate. Returning the spindle to place and again putting the bushing upon it, the anvil may be lapped by means of the small circular laps, the necessary lapping pressure being applied by the micrometer screw.

The uncharged sides of the laps are in this operation turned towards the bushing, and the comparatively large surface of the latter insures that the anvil will be lapped parallel to the already corrected surface of the spindle.

By using the three laps successively, the anvil is lapped in three positions of the spindle approximately 120 deg. apart.

Center Drill Used for Spotting

By Gus Haessler

On page 565, Vol. 55, of *American Machinist*, G. G. Little describes the use of a combined center drill and countersink as an end mill.

A combined center drill and countersink can also be used to advantage in spotting work. If an ordinary twist drill is used for spotting, an irregular outline is often produced on the surface of the work, rendering a scribed guide circle useless. By using a combined center drill and countersink, the countersink will make a round spot and the concentric relation between the spot and the guide circle can easily be seen. If the spot should be eccentric with the guide circle the work can be pressed to one side as the drill is fed down, so as to have the countersink cut more on one side or the other and by careful manipulation the spot can be brought concentric with the guide circle.

In laying out guide circles we found that with one point of the dividers located at the intersection of the

layout lines, the work can be sufficiently indented to form a center for scribing a circle by pressing down on the dividers. The dividers should, of course, have sharp points.

A Shop Man's Method of Figuring Change Gears

By J. Crommell

There are many ways to figure the change gears required to cut a given thread on a lathe. Some are absurdly technical and confusing, necessitating the use of both sides of a slate on which to make the calculations, while others are simple and easy.

One of the best ways that I know—one that is most commonly used by practical men and is the basis of all of them—is to express the required lead as a fraction and multiply the numerator or divide the denominator by the number that represents the lead of the leadscrew.

The first problem that I will cite is a simple one, the gears for which will be found on any index plate, and the plate may be referred to as proof that the method is correct.

Problem 1. We wish to cut sixty threads in 4 in. The fraction expressing this lead is 4/60 (which is the lead of one thread, or the distance a nut would advance upon it in one turn) and the lead of the lathe is 5. Multiplying 4 by 5 gives us 20/60, the correct gears to use. Dividing 60 by 5 would give us 4/12, which is the proportion of the gears. We could reduce this still further to 1/3, indicating that we may use any pair of gears one of which is three times larger than the other.

Problem 2. Required twenty-seven threads in 5 in. The fraction in this case is 5/27 which multiplied by 5 is 25/27, the proportion of the gears.

Problem 3. Required, ten threads in 7 in. As this is heavier work we will assume that the lead of the lathe is 2. The lead of the thread to be cut is 7/10, which multipled by 2 is 14/10. We will not have gears with so few teeth so we multiply *both* terms by the same number, thereby keeping the same proportion, until we find a pair that is available; thus 14/10 x 2 is 28/20; x 3 is 42/30; x 4 is 56/40.

If we reduce the fraction of the above problem to 7/5, its lowest terms, we will have another range of numbers from which to select gears, thus 7/5 x 5 is 35/25; x 7 is 49/35.

Problem 4. Let us reverse our requirements as above and cut a thread of seven turns in 10 in. The lead is now 10/7, which multiplied by 2 is 20/7, the proportion of the gears. The actual gears in this case will be 60/21 or 80/28. The larger gear always goes on the stud when the lead to be cut is greater than the lead of the screw.

Problem 5. Four turns of a thread are required in 4¼ in. The fraction expressing this lead is 4¼/4 or 17/16. Multiplying by 2 (the lead of the lathe), we get 34/16 as the proportion. The actual gears will be 68/32, or reducing the fraction to 17/8 and multiplying by 3, 51/24.

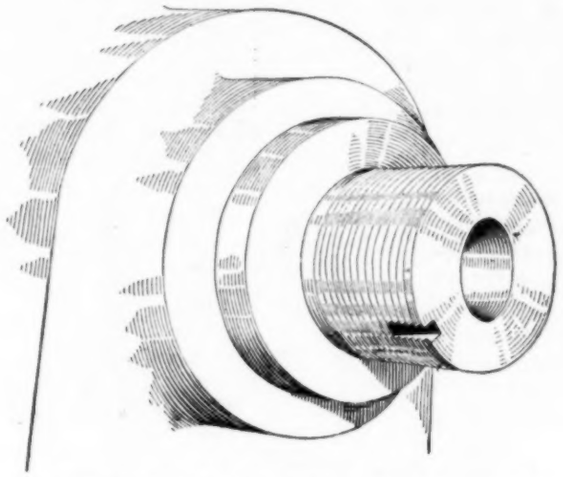
All of the above problems are based upon the assumption that the spindle and stud of the lathe are evenly geared. If such is not the case we must disregard the actual lead of the screw and substitute in its stead the number representing the thread that the lathe would cut in one inch with even gears on stud and screw.

Kink That Saves Trouble in Putting on Lathe Chuck

By Henry Knabe

Most of us have experienced trouble in putting a heavy chuck on a lathe spindle by reason of small particles of dirt or chips lodging in the internal thread, making it necessary to return the chuck to the bench and poke around for several precious minutes with a wire or thread cleaner.

To abate this nuisance as far as possible I have filed



A LITTLE KINK THAT SAVES MUCH TROUBLE

a shallow groove, as shown in the sketch, in the threads of the spindle nose; leaving the advancing side of the groove square and sharp, like the threads of a tap.

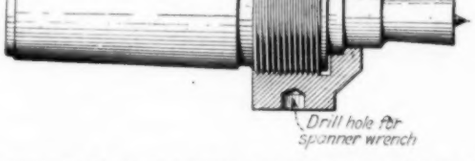
Upon screwing the chuck on the spindle these sharp edges scrape out any particles that may be in the internal thread and the groove provides a place for them to get out of the way.

Chuck for Refinishing Standard Piercing Punches

By Fred S. Harger

The illustration shows a chuck which the writer has made for the purpose of repairing or salvaging the standard sheet-metal piercing punches so commonly used.

The device is quite simple to make, consisting only



CHUCK FOR HOLDING PIERCING PUNCHES

of a shank, tapered to fit the lathe spindle and threaded on the outer end to take a knurled sleeve.

It is desirable to make a rather fine pitch thread in order to increase the gripping power; or, rather to diminish the manual effort necessary to exert that power. If the facilities are available it is advisable to harden the sleeve and grind the internal parts to a

finish, because this will increase the durability of the tool. A hardened steel button in the outer end of the shank, if ground true in place, will also help to increase the life of the tool and insure continued accuracy in holding the punches.

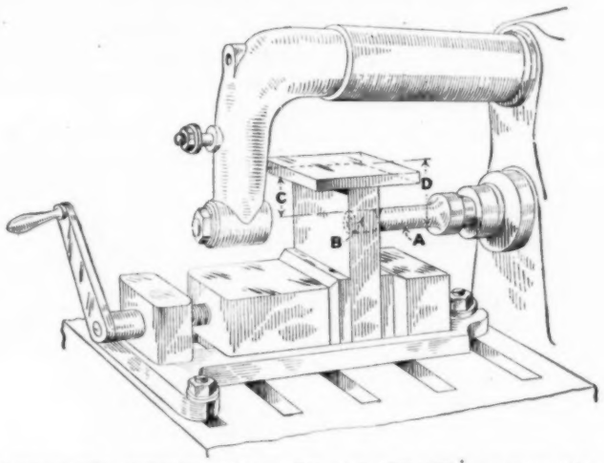
Handy Locating Device for the Milling Machine

By Frank M. Johnson

The locating device described here has been found by the writer to be very convenient and accurate. It consists of a short arbor *A* to fit the milling machine spindle, having a toolmakers' button attached to the outer end.

In use, the device is placed in the milling machine spindle and the button *B* trued up with an indicator. The work is then brought into position so that a size block of the proper dimension will just fit between the button and a parallel resting upon the top of the work, as indicated by the dimension *C*. If more convenient, a micrometer can be used on dimension *D*.

The writer recently used this device to locate thirty-



LOCATING DEVICE FOR USE ON MILLING MACHINE

seven holes in a piece approximately 1 x 5 x 14 in., the tolerance being plus or minus 0.001 in. in both directions. All the holes came well within this limit.

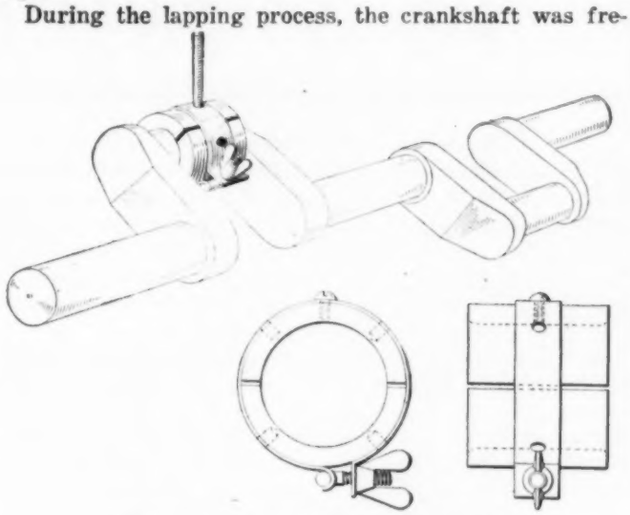
Lapping a Pitted Journal to Make It True

By Fred. A. Clock

On a marine gasoline engine repair job, it was found that salt water had gotten into the base and that journals on the crankshaft throws were rusted and pitted badly. As it was not practical to have the shaft reground, we decided to lap it and a lap was made as shown in the illustration.

A cast-iron bushing was bored out to the exact diameter of the shaft, and was turned on the outside so as to leave a wall ⅜ in. thick. It was cut off about 1 in. shorter than the journal and the inside corners rounded to fit the fillets on the shaft. Next it was sawed lengthwise so as to leave two half bushings, the halves being prick-punched so as to insure their always going together in the same relative position. A hose clamp was then fitted over the two halves and fastened to one of them by means of a round headed screw. Four equally spaced holes were drilled through the clamp and the lap, those in the clamp afterwards being reamed out with a slightly larger drill. These holes were for the purpose of inserting a handle, made of ¼-in. stock, for operating the lap.

During the lapping process, the crankshaft was fre-



TRUING A JOURNAL BY LAPPING

quently turned part of a revolution so as to bring the journal into different angular positions. As the four holes in the lap were also consecutively used in this way, all danger of uneven lapping was eliminated.

The lapping material used was ordinary valve grinding paste. After lapping for a few hours, the journals were brought to a smooth bearing surface.

The engine has now been in operation for seven months and the bearings have given no trouble whatever.

Jig for Drilling Crossholes in Round Stock

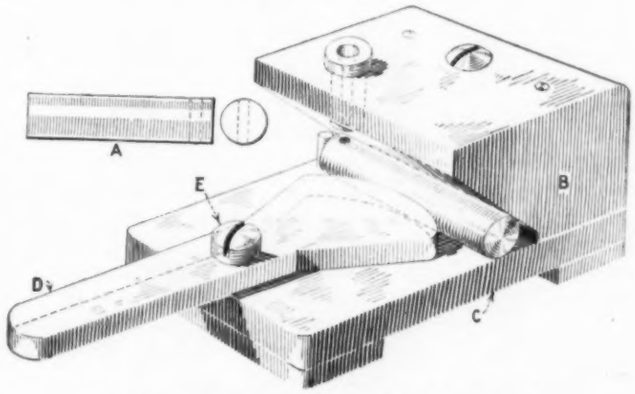
By Gus Haessler

On several occasions contributors have described work similar to that shown at *A*. The jig outlined herewith differs, as far as known to me, from any heretofore published and therefore may be new to others.

The principal members *B*, *C* and *D* are made of cold rolled steel, and are pack hardened. Part *B* is fastened to *C* in the usual way, while the clamping lever *D* fulcrums on the screw *E*.

A slow rise cam is formed on the end of the short arm of the lever, the proper action of which is determined by trial in assembling.

In operating the jig, the work is simply dropped into the cage and is checked by the stop pin, the lever then being pressed to the right. To eject the work, the lever is reversed and the work drops out.



A SIMPLE DRILL JIG FOR ROUND STOCK

EDITORIALS

The American Valuation Plan

IN THE midst of the confusing welter of assertion and denial from those whose interests are affected by the proposed American Valuation Plan, many are turning to the professional economists for counsel. This group takes a remarkably united and unequivocal stand in opposition to the measure. The grounds upon which they take their stand are roughly these:

In the first place, they believe that the proposed plan really means a higher tariff. They recognize that the precise rates to be imposed on the American values are the determining factor here, but they are convinced that those urging the plan intend to see to it that the rates shall be sufficiently high to cover any uncertainty incident to the establishment of the new valuation basis. They suspect that at bottom the proposal resolves itself into a demand for a hidden and undetermined amount of increased protection.

The arguments, aside from this, do not impress the economists. The three which contain some modicum of force are that the plan will meet the problem of the fluctuating exchanges, that it will prevent "dumping" and that it will put up a more effective bar against the country with exceptionally low production costs. The economists point out, however, that prices rise in countries whose exchanges fall and that any disparity in the two movements is largely offset by the internal disorganization of the productive forces in the country whose exchanges are violently deranged. "Dumping," they believe, can best be prevented by administrative measures applied when the facts of a particular situation demand them. The argument that the present method of valuation puts a lower duty, for example, on cheaply produced Japanese goods than on more expensively produced European goods of the same character is admitted, but it is pointed out in rebuttal that specific rates would meet this situation as well as the American valuation plan.

On the other hand, the economists are considerably influenced by the contention that the adoption of the proposed plan would introduce so much uncertainty into the process of importing goods as to greatly embarrass the process. A retailer, buying foreign merchandise, cannot estimate his costs with any degree of precision under the proposed plan. Uncertainty of this character is a very patent anaesthetic to business enterprise. The economist suspects that the adherents realize this and view it with complacence because it means fewer imports and less foreign competition.

The administrative difficulties of securing fair cost figures from American manufacturers interested in excluding their rivals' goods, of determining American costs in the case of goods which America does not make, and of securing uniform valuations at various points of entry, are perfectly self-evident. Furthermore, it is contrary to all past practice and procedure in this country. It constitutes, in the words of Professor Taussig, the foremost student of the tariff in this country, "a veritable leap into the dark."

But, after all, the opposition of the economist rests back upon his conviction that the proposal is equivalent to a demand for increased rates at a time when the true economic interests of the country would not be served by the establishment of a high tariff wall. The changed conditions resulting from the war have convinced many, who previously were in favor of high protection, that we cannot hope for a real business recovery until we reach an economic adjustment which the high tariff will tend to prevent or postpone. The question of American valuations should not be settled without a full consideration of all of these elements.

A National Engineering Research Laboratory?

AT THE recent meeting of the American Society of Mechanical Engineers the suggestion was made during the course of the research session, that it would be desirable to have a national engineering research laboratory. The proposer advocated such a laboratory "to do for engineering what the Bureau of Standards is doing so well for pure science."

The wisdom of this suggestion seems to us to be open to question. In the first place the Bureau of Standards has not confined its work to pure scientific research by any means. Many essentially engineering problems have been solved at the bureau, with the co-operation of research engineers from various industrial corporations, and facilities exist for solving many more if the men who are anxious for a solution based on engineering research will present them and co-operate with the bureau officials and staff. It is rather a case of insufficient advertising of the bureau's resources.

By the very nature of the organization of a government institution certain difficulties present themselves. Insufficient funds, departmental red tape, an inadequate number of research men are all factors that hamper the successful prosecution of engineering research at the bureau to speedy conclusions. But the relief from these drawbacks does not lie in establishing another institution but rather in helping the existing one to attain a position where it can handle the job.

Another serious obstacle in the way of organizing another research laboratory lies in the small number of research men available in this country. While there are enough for one big laboratory there would be great difficulty in obtaining a really high grade staff for a second one. Research men are scarce and cannot be trained in a year—or five for that matter. It might well be said of the research man as of the genius, that he must have an infinite capacity for taking pains. Unfortunately such a characteristic is not common among Americans. Another factor which must be considered is that the research man must either have some independent means or else a devotion to science sufficient to make him sacrifice a comfortable living, for present salaries are inadequate, especially when compared with those attainable by the same men in private business.

By all means let us have facilities for engineering research but let us not adopt the wasteful plan of unnecessary duplication of effort and equipment.

Shop Equipment News

Stewart Furnaces and Forges

The Chicago Flexible Shaft Co., 5600 Roosevelt Road, Chicago, Ill., has recently placed on the market the Stewart line of furnaces and forges for general shop use. In Fig. 1 is shown a high-pressure burner intended for operation with air at a pressure of 10 lb. per square inch or over, or for dry steam at a pressure of 25 lb. per square inch. The burner produces an intimate mixture of the fuel and air, is rugged in construction and adapted to severe service. In Fig. 2 is shown the combination high- and low-pressure burner for operation with compressed aid at a pressure of 10 lb. per square inch or over, or with dry steam of 25 lb. per square inch, and with blast air at from 4 to 6 oz. pressure. Only sufficient compressed air to atomize the oil is used, while the remaining air for combustion is supplied by a fan at low pressure. This burner is said to be capable of producing high heat, and to permit of exact control of conditions inside the furnace. The intermediate pressure burner shown in Fig. 3 is for operation with air at pressures of from 1½ to 2 lb. per square inch, and supplied from a positive-pressure blower. Atomization of the oil is said to be complete, insuring efficient utilization of all the fuel.

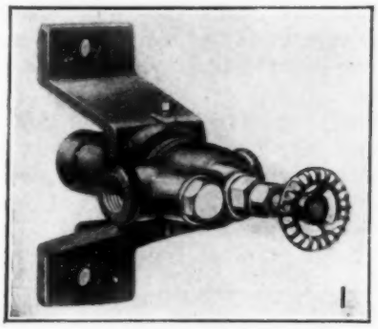


FIG. 1. STEWART HIGH-PRESSURE BURNER

FIG. 2. COMBINATION BURNER

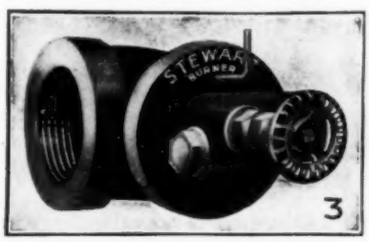


FIG. 3. INTERMEDIATE PRESSURE BURNER

The No. 6 portable rivet forge shown in Fig. 4 is for use in connection with either machine or hand work. The forge burns oil, and employs compressed air for atomization. It is stated that the furnace is capable of heating five hundred ¾-in. rivets per hour. The capacity is 30 gallons, the oil being forced to the burner and atomized by the compressed air from the shop line, reduced to 20 lb. per square inch pressure by a regulating valve. An asbestos flame shield and blast pipe are provided to protect the operator. If desired, the forge may be mounted on a truck. The chamber of the furnace is 12 in. wide and 12 in. deep, the opening being 3 in. high and 7 in. wide. The height from the floor to the top of the sill is 40 inches.

In Fig. 5, is shown an oil-fired furnace intended especially for the tempering of dies, tools, punches and knives. The oil bath is heated slowly to a temperature of not more than 700 deg. F., and then is allowed to cool down rapidly to permit the addition of a new charge. The furnaces are made in five sizes, and adapted to the use of either gas or oil as fuel. The weight varies from 355 to 1,550 pounds.

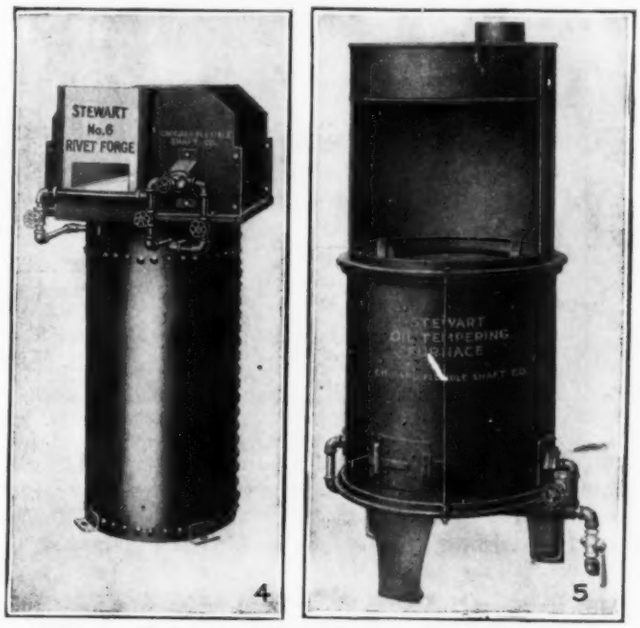


FIG. 4. STEWART PORTABLE RIVET FORGE. FIG. 5. OIL TEMPERING FURNACE

The Stewart No. 200 crucible furnace, shown in Fig.

FIG. 6. NO. 200 CRUCIBLE FURNACE

6, is intended for use in lead or cyanide hardening, soft-metal melting, tinning baths and galvanizing. It is stated that the flame is given a rotary motion by virtue of the position of the burner, and that there is a

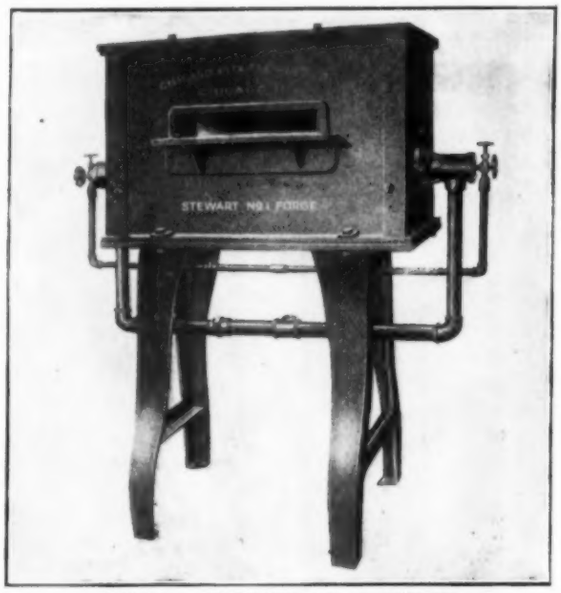


FIG. 7. STEWART NO. 1 FORGE

uniform distribution of heat around the pot, thus lengthening the life of the crucible and permitting of accuracy in the work. The pressed-steel pot is 14 in. in diameter and 14 in deep. A No. 5 blower is required, and either gas or oil may be used as fuel. The floor space is 36 x 36 in., and the shipping weight 1,300 pounds.

The No. 1 forge, shown in Fig. 7, is for use in welding and in miscellaneous forging work, as well as for heating rods and bolts prior to upsetting. Combustion occurs both beneath and at the sides of the opening, the flame striking the work directly. It is said that high heats are obtainable with great economy of fuel, either gas or oil being employed. The opening is 12 x 2 in. in size, with an inside depth of 8 in. The floor space is 32 x 24 in., and the shipping weight 800 pounds. The double-deck furnace shown in Fig. 8 is for heating high-speed steel with rapidity and with accuracy in temperature. The upper chamber is used for preheating, and is heated by the waste gases from the lower chamber. Economy of fuel is claimed for the arrangements. The lower chamber is fitted with carbofrax slabs to withstand the high temperature. Combustion takes place under the floor, and a uniform heat is said to be obtained because of the placement of the burner and the high heat conductivity of the walls. In order to conserve the heat, 4½-in. linings having a special insulation 1 in. thick are employed. The furnace is made in five sizes, having openings varying from 5 x 9 in. to 6 x 12 in. Gas is used as fuel. The smallest size has a floor space of 28 x 30 in., and the largest of 36 x 40 inches. The furnace enables the quick heating of tools, with close control of the temperature and of the character of the treatment, a reducing flame being easily obtainable.

FIG. 8. DOUBLE-DECK HIGH-SPEED-STEEL FURNACE

A furnace for handling large forging work is shown in Fig. 9. It is equipped with large enough burners to give high welding heat, and with provision for running off the slag at the rear. Doors may be provided at each end, if desired. Either oil or gas may be burned. The furnace is made in a range of sizes, the smaller sizes

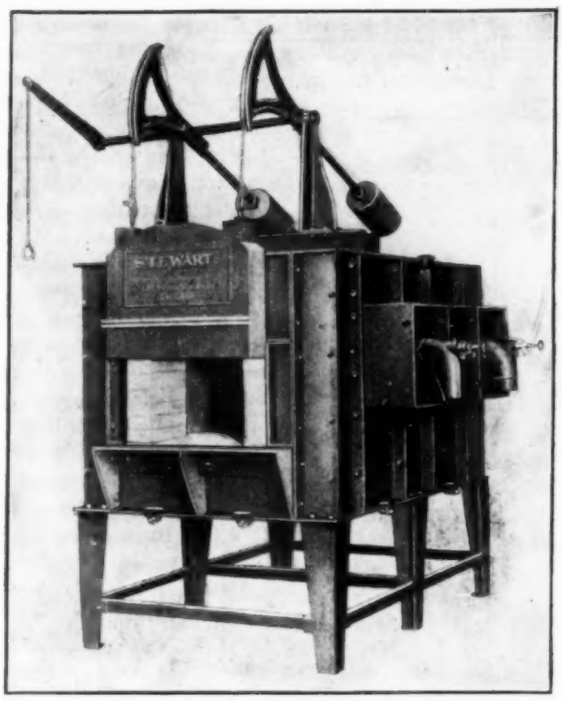


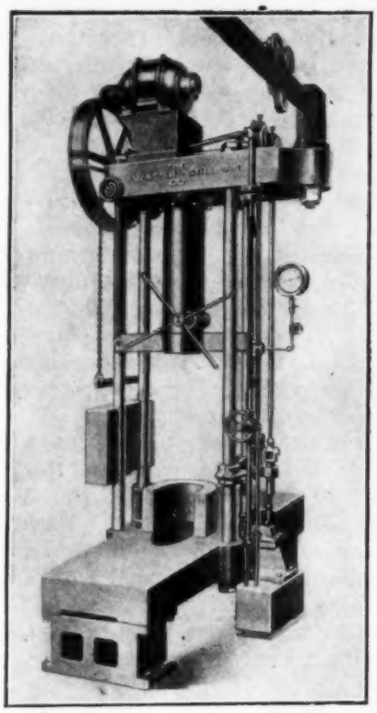
FIG. 9. STEWART HAMMER FORGE

being mounted on legs, as shown. The same type of construction, that is, the iron-plate and fire-brick type, is employed in the large sizes, which are built up on brick foundations. In the smallest size of furnace, the chamber is 27 in. wide and 36 in. deep. In the largest size, which is of the double-door type, the chamber is 99 in. wide and 63 in. deep. The sill height is 27 in. for all models.

In the sizes having chamber dimensions up to 36 in. in width by 63 in. in depth and entrances 22½ in. wide by 20½ in. high, the furnace may be mounted on legs. In this form, it is particularly adaptable to the heating of forging and welding work for steam hammers. However, the construction of the furnace makes it suitable for practically all purposes. In the larger sizes, having chambers from 36 in. in width to 49 in. in depth and mounted on brick foundations, the furnace is adaptable particularly to heavy or medium forging work.

Watson-Stillman Forcing Press

The Watson-Stillman Co., 50 Church St., New York, N. Y., has recently placed on the market the hydraulic press herewith illustrated, the machine being intended especially for the operations of forcing, pressing and bending that are found in railroad and in other large machine shops. It provides a means of rapidly pressing in and out locomotive driving-box brasses, or pressing on and off gears or disks. The press is of the reversed - cylinder type, having the ram movement from the top downward. The pump is required only to actually apply the pressure, the handwheel being used to bring the ram quickly to and from the work, thus obviating the necessity for waiting while the pump moves the ram through the idle part of the stroke. The bottom platen is strong enough to permit of bending operations up to the full capacity of the press with the bending blocks placed at each end of the platen. A U-shaped piece is hinged to one of the columns, so that it may be easily swung under the ram or out of the way. A jib is furnished with a trolley, so that a chain hoist may be attached for easily handling the work on and off the platen. A hole in the bottom platen permits of receiving shafts and pressing on gears. The drive may be either by belt through tight and loose pulleys, or by direct-connected constant-speed motor, as shown.



WATSON-STILLMAN PRESS

The gage indicates the pressure on the ram in pounds per square inch, and also the total pressure in tons. The pump used is of the two-plunger type, and the entire control of the press is through a single screw stem valve. The bottom platen, top platen, cylinder and crane brackets are open-hearth steel castings, the ram and rods are machine steel, and the cylinder copper lined. The press illustrated is built in a capacity of 75 tons with a ram movement of 21 in. The bottom platen is 72 in. long.

Oliver No. 65 Self-Feed Rip Saw

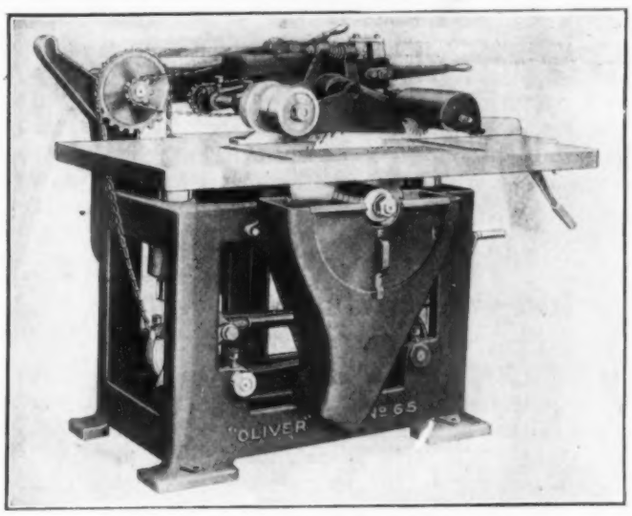
The accompanying illustration shows the No. 65 self-feeding rip saw recently placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine incorporates improvements over the Oliver machines of the type already on the market, chiefly with regard to the safety features and the dust chute. The machine is intended for ripping all kinds of lumber, being adaptable to the handling of either rough or finished stock.

The saw arbor is mounted on a frame provided with a vertically adjustable table. The in-feed spur roller is made either corrugated or smooth, according to the requirements of the work, and it carries the stock across the top of the table and through the saw. The machine will carry saws up to 18 in. in diameter, will cut lumber up to 5 in. thick, and rip up to 24 in. wide. A gang of six saws with 1-in. spacing collars may be used at one time.

There are three rates of feed, 80, 110 and 140 ft. per minute. Quick adjustments are provided for the feed rollers and the ripping fence, which can be easily locked in position. A mechanism is provided for absorbing shock on the feed rolls, so as to overcome jerks upon starting stock through the machine. A difference in thickness of $\frac{3}{4}$ in. is permissible in the stock without readjusting feed roll.

The lower portion of the saw is thoroughly guarded by means of the dust chute, which can be connected directly to the exhaust system. The upper portion of the saw runs in a guard carried by the feed mechanism. The star feed and the in-feed roll are covered by a metal guard, so as to prevent accidents to the workman while feeding the machine.

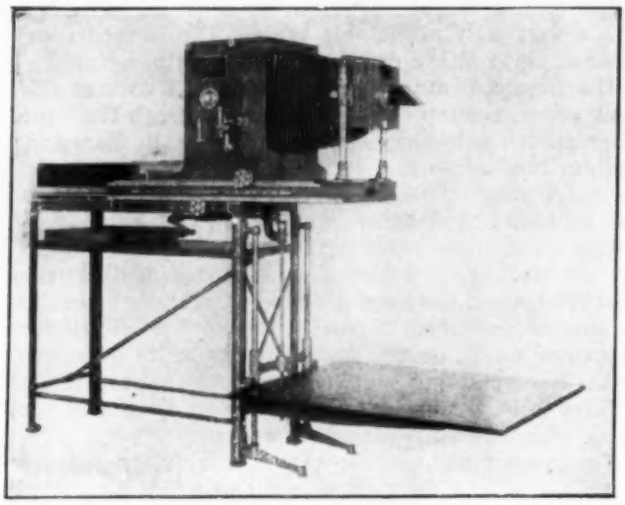
The table is $33\frac{1}{2}$ x 56 in. in size, being adjusted vertically by means of a lever locking cam. The saw arbor has self-lubricating chambers. If desired, the machine may be arranged for motor drive. The regular equipment of the machine includes one 16-in. saw, a saw guard, feed spur and guard, splitter, one plain and one corrugated sectional out-feed roll, filling collars and sawdust chute.



OLIVER NO. 65 SELF-FEED RIP SAW

Improvements in the "Photostat"

The Photostat Corporation, 299 State St., Rochester, N. Y., has recently made some improvements in its "photostat," or photographic copying machine. The chief feature of the machine is its all-metal construction, making it durable and light in weight. The machine is made in the same sizes as heretofore furnished. Roller bearings are used for the magazine and bellows, so that these parts may be easily moved backward and forward. The mechanism for elevating and lowering the engineering copyboard or bookholder has been changed, it being stated that the weight of a man on the copy-



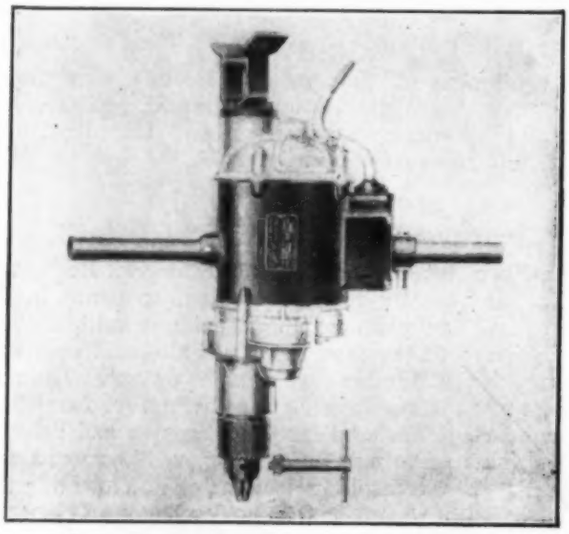
ALL STEEL "PHOTOSTAT"

board may be very easily lifted by turning the elevating handle.

The design of the developing tray makes it practically a separate developing tank carried on the side of the machine. Protection is given for all the other parts of the photostat from the possible splashing of chemicals, or erosion from the escaping fumes of the chemicals. The knife mechanism used for cutting off prints has been strengthened. An adjustable curtain on the magazine operates on special gear wheels and rollers. The function of the curtain is to make the magazine positively light proof and to protect the sensitized paper when the magazine is open. The height of the curtain can be adjusted by turning a knob, so as to give the proper length of sensitized paper for the exposure.

Hisey "Super" Universal Portable Electric Drill

In the accompanying illustration is shown the Hisey "super" universal portable electric drill recently placed on the market by the Hisey-Wolf Machine Co., Cincinnati, Ohio. The drill is intended for operation on either direct-current or single-phase alternating current of any frequency from 25 to 60 cycles. The principal feature to which the maker calls attention is the fact that the machine is equipped with ball bearings throughout. It is stated that in the mounting of the bearings, spring tension is provided, thus permitting expansion and contraction of the shaft without distortion, and insuring uniform stress on the different parts of the bearings.



HISEY "SUPER" PORTABLE ELECTRIC DRILL

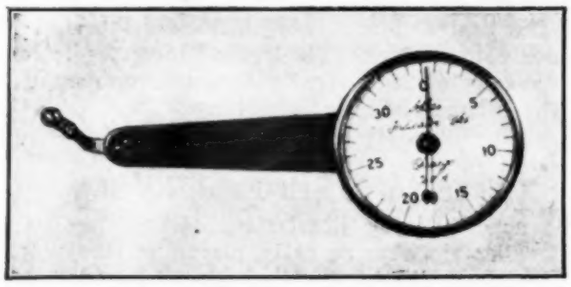
A quick-operating external cable connector permits of mounting or removing the cable without disturbing or dismantling the parts of the machine. The switch is mounted externally, but is protected by the removable switch handle cover. The brush holder is made of bakelite, and is not affected by oil, moisture or atmospheric conditions. The complete yoke is adjustable in position, so that the brushes can be shifted from the outside without dismantling the machine. Forced ventilation is provided. The cool incoming air passes over the commutator and the brushes before being drawn through the motor and expelled.

The drill is made in three sizes, having capacities in steel of $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. It is ordinarily supplied for operation on voltages of 110 or 220, although it can be furnished for special voltages up to 250. Each machine is ordinarily supplied with 15 ft. of electric cable fitted with a suitable attaching plug, and with a Jacobs drill chuck for holding straight-shank drills. If desired a Morse No. 1 taper socket can be furnished. The drill may be fitted with a screw-feed, breast-plate, grinding-wheel, flexible shaft for drilling or grinding, and with a stand for converting it into a bench drill. The machines weigh respectively, 18, 22 and 24 pounds.

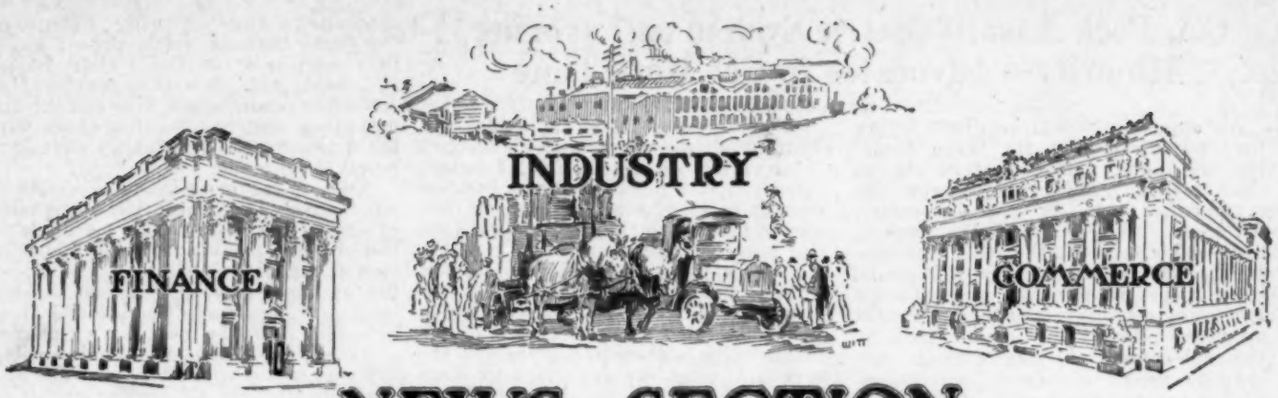
Atlas "Junior" Dial Indicator

A small dial indicator, designated as the "Junior," has recently been placed on the market by the Atlas Indicator Works, 160 North Wells St., Chicago, Ill. The device, shown full size in the accompanying illustration, weighs but $\frac{3}{4}$ oz. It is said to be very sensitive and durable.

The housing is made of machine steel and case-hardened, while the important working parts are made of tool steel and hardened. A swiveling clamp is mounted on the back of the housing, so that it is possible to turn the dial to the most convenient position for reading, and to mount the instrument in the position required for the work. The indicator is graduated to read to 0.001 in., and has a range of 0.055 in. The position of the contact point can be changed, so as to facilitate different sorts of inspecting operations. After adjusting the contact point on the work, the dial may be revolved so as to bring the zero mark in line with the indicator hand.



ATLAS "JUNIOR" DIAL INDICATOR



NEWS SECTION

Pennsylvania Orders 80,000 Tons of Rails

Pennsylvania Railroad has concluded contracts involving 80,000 tons of steel rails, for delivery in the current year. In December, 1920, the company placed orders for 200,000 tons for delivery in 1921. The steel trade a while ago estimated that the Pennsylvania would contract for about 150,000 tons, but later the figure was reduced to 100,000 tons.

The Pennsylvania last year laid in the neighborhood of 160,000 tons of new rails, the largest amount since 1916, and carried over to 1922 about 50,000 tons.

This carryover, together with the 80,000 tons just contracted for, will give the road 130,000 tons of rails for 1922.

The order was alloted as follows: Forty thousand tons to the Carnegie Steel Co., 18,000 tons to the Bethlehem Steel Co., 18,000 tons to the Cambria Steel and 4,000 tons to the Lackawanna. The contract calls for 130-pound open-hearth rails, the price of which was reduced $7 a ton last October.

Committee Appointed to Standardize R.R. Ties

The American Railway Engineering Association and the U. S. Forest Service have been designated by the American Engineering Standards Committee as joint sponsors for the unification of specifications for wood crossties and switchties for all classes of use including mining ties. The work is to include the grouping of ties with regard to preservative treatment, but not methods of treatment, and also inspection rules. This action is in accordance with the recommendations of a conference on railroad ties, at which the following organizations were represented: American Electric Railway Association; American Railway Engineering Association; American Society of Civil Engineers; American Society for Testing Materials; National Association of Railroad Tie Producers; National Hardwood Lumber Association; National Lumber Manufacturers Association; U. S. Department of Commerce; U. S. Forest Service.

For carrying out the work there will be organized by the sponsors a sectional committee having accredited representatives of the above organizations and of the American Mining Congress, and the American Wood Preservers Association.

American Machinery Wins in Spain

Pessimists who have been flooding the country with statements concerning the inability of American exporters to compete in the world's markets because of ruinous European price quotations, will find food for thought in a Department of Commerce announcement of another American trade victory in Spain.

Reports reaching the Department of Commerce from Spain indicate that the Spanish government has just awarded a contract to an American company for printing presses for the national mint. The American bid was 40,000 pesetas higher than the Spanish bid, and 25,000 pesetas above the German bid. The other bids submitted were too far out of the way to be considered in the awarding of the contract.

Technically Perfect

In commenting on the award the *Gaceta de Madrid*, a Spanish newspaper says: "Notwithstanding the fact that the German machine has an established reputation in Spain and these machines were offered at a price which was thousands of pesetas lower for each machine than of the American, the latter is considered the most technically perfect of its kind." The American machine, aside from producing the greater output, is the most economical and reliable of these machines, according to the government experts deciding the question. The American machines won on their merits.

Officials in the Department of Commerce feel that this news should prove helpful to those American exporters who have long believed that lower prices are not always the most important or the ruling factor in successful merchandising abroad. Service, delivery and credit arrangements carry great weight with importers in foreign countries and in these respects the American business man is usually on an equal footing at least with his price cutting competitors. Information had reached the Department that some of the German merchants had fallen down on their Latin-American contracts—they were finding it impossible to make delivery at the prices and terms originally offered. While low prices would for a time retard certain American exports, other distinctive American products will always be in wide demand abroad, irrespective of prices, because of the reputation which such products have established.

Treasury Reports Reduction in Public Debt

A reduction in the public debt of more than $180,000,000 during December was announced on Jan. 4 by the Treasury. The total debt on Dec. 31 was $23,438,984,351, as compared with $23,619,085,725 on Nov. 30.

The reduction reported makes a total of more than $543,000,000, as compared with December of 1920, when the total debt was $23,982,224,168, and a reduction of more than $485,000,000, as compared with the total at the end of the previous quarter on Sept. 30, 1921, when the debt was $23,924,108,125.

Industrial Engineers Elect J. W. Roe

The Society of Industrial Engineers, a member society of the Federated American Engineering Societies, has elected Joseph W. Roe, head of the industrial engineering department of New York University, as its president. W. G. Sheehan, of Detroit, has been chosen secretary, and F. C. Schwedtman, vice-president of the National City Bank, New York City, treasurer.

Four vice-presidents in charge of four phases of the society's work have also been chosen. Dwight T. Farnham, of C. E. Knoeppel & Co., New York City, was elected vice-president in charge of education; E. E. Arison, of Chicago, vice-president in charge of finance; Edward J. Kunze, head of the department of industrial engineering, Pennsylvania State College, vice-president in charge of research; and William S. Ford, of Milwaukee, vice-president in charge of promotion.

The society has now completed plans for the annual spring meeting which will be held at the Hotel Statler, in Detroit, April 26, 27 and 28.

A Market in Latvia

Farm machinery is very much needed in Latvia, according to recent reports from trade commissioner H. Lawrence Groves to the Department of Commerce. The Central Agricultural Cooperative Society of Latvia has issued a statement outlining these requirements, and states that this machinery should be furnished within the next two years. At present the intention is to replace only the machinery destroyed or removed as a result of the war. This does not cover the needs arising from the large number of farm units established in the last few months.

Col. Peck Assails Metric System as Favoring Minority—Advocates to Get More Time

An opportunity will be given before the end of January for those favoring the Ladd metric system bill to offer testimony and briefs to rebut the arguments made by the anti-metric witnesses. This will close the hearing. Senator McNary and the other members of the sub-committee then will make their report to the full committee on manufactures. As it is believed that an adverse report will be submitted by the sub-committee, the chances are that no metric legislation will be reported out at this time.

It is known that Ordnance officials are very much concerned lest by some chance legislation of this type be passed. Their feeling is that it is difficult to induce the average busy legislator to study deeply enough into such a question to arrive at conclusions of his own, and not be influenced by apparent advantages which disappear when knowledge of the question goes beyond the superficial.

An Ordnance estimate covering a change in the gradation of the sight slide of the small arms rifle from American units to metric units—yards to meters—shows that the change on all the small arms in the possession of the Government would cost $2,678,000. If the cost would be so great for a small change of that character it gives an indication as to the expense that would be involved were general changes made necessary, it is argued.

A brief resume of the arguments laid before the Senate committee by E. C. Peck, of the Cleveland Twist Drill Co., is as follows:

"The bill will cause endless confusion in the industries for an extended period. It seems to indicate in section two that immediately upon its passage the metric standards now at the Bureau of Standards become the primary standards from which all others are derived, but that punishment for failing to adopt them begins ten years from that date. The result will be the immediate adoption of this new standard for some industries, whereas others will not adopt it until the last minute. The whole manufacturing public will be without a consistent standard for ten years.

"The bill gives a cabinet officer, the Secretary of Commerce who changes every four years, too much power by authorizing him to make and promulgate the rules and regulations for the enforcement of the act. Courts finally would pass upon these matters, but the power to make preliminary definitions puts into one man's hands the power to work disastrous hardships. With a Secretary of Commerce favorable to the metric system, a ruling likely would result that farm products, land, etc., would have to be sold in metric terms. Such a ruling soon would set up an enormous number of agencies all over the country to translate the land records into metric units. Law suits would follow, due to mistakes. At least it would result in a fee being charged to every seller or purchaser of land for the making of a legal translation of the present land measures. From this it would be only a step to a licensed body of mathematicians charging fat fees for translating values for farmers and laymen.

"The statement often is made condemning our present system on account of the variety of bushels used. I cannot endorse that kind of evidence because practically everything we buy and sell now is handled in hundred-pound lots. The hundred-pound unit has come to be very nearly a standard in farm use.

"It is not clear what would become of stocks of tools the sizes of which are not in either the inch system or the metric. The alphabetical sizes and the numerical sizes are demanded in large quantities both in the United States and abroad.

"The passage of this bill would endanger all American standards because the adoption of the metric system will require a translation of all dimensions into metric units. It is impossible to think that other countries are going to adopt our sizes of machine parts, structural steel and other equipment, with dimensions in unheard-of fractions of the millimeter. There will be a constant endeavor to lop off the fractions or add to them, to make a nominal standard. Then all our tools and equipment become special. We must standardize all over again to meet this nominal or round number size. Take gearing for an example. It is highly standardized in the United States. Gears bought in one city will fit and function properly with gears bought in another. These gears are largely used. There are millions of them. They will not fit any of the gears now proposed by the metric countries. There is not a single pitch in the metric system that will fit the United States system now used so universally. Take the well-known twelve-pitch gear used by the thousands in this country and carried in stock commonly by large machinery dealers. The nearest pitch to this in the metric system is Module 2, but they will not run together because the U. S. gear tooth would be 0.007 in. too thick for the space in the metric.

"To get the metric countries to use our twelve-pitch standard translated into a metric module would be to ask them to change from a 2 module to 1.889 module. They would stand out against this awkward fraction and ask us to change our standard to Module 2, which would mean that the millions of gears on hand no longer would be interchangeable with the new product. Millions of dollars worth of gear-cutters, together with the necessary gages for checking this product, would become obsolete.

"The United States makes more than one-half of the screw-thread products of the world. It is the most interchangeable of any in the world. The metric system does not have a single diameter of bolt or pitch that will fit those now being made so extensively in the United States. There is no comparison between the methods used in metric countries and those of the United State for originating the correct size of a screw or a thread gage. This was evidenced plainly by the failure of the French mechanics during the war to make thread gages which were interchangeable or true to the dimensions prescribed for them. The threads on three out of the five French 75-mm. artillery pieces sent over to the United States did not interchange nor did they conform to their drawing dimensions for these threads. The thread gages they sent over to the United States to check the interchangeability of American made guns, did not fit the guns they sent nor did they check with the dimensions to which they were supposed to be made.

"One of the most valuable assets of our industry is a conception in the mind of the average American mechanic of the physical meaning of the dimension 'one thousandth inch.' All clearances, fits and tolerances are known in shop language as so many 'thousands.' These dimensions are the mechanic's alphabet.

"The compulsory use of the metric system would penalize too large a majority for the advantage gained by a small minority. The line is drawn between those who perform their work nearly entirely with paper and pencil and the great mass of producers, and people who deal with the actual physical representations of the standards. This proportion is more than a hundred to one. A hardship is worked on the hundred to help the one who is best fitted by education and training to take the harship, if any exists. The small proportion of the public benefited by the metric system is the better situated to use the present current units, even if it does not admit of rapid calculation decimally.

"As the product of locomotive and crane builders and makers of large special machinery is not standardized, as they carry no stocks and as their parts have little or no interchangeability, it is a matter of indifference to them whether or not their system of measurement is changed between one lot of manufacture and another."

Connecticut Manufacturers See Foreign Competition

The Manufacturers' Association of Connecticut, held its eleventh annual meeting at the Taft Hotel, New Haven, Conn., Dec. 29, and the following officers were elected for the ensuing year: E. Kent Hubbard, manufacturer, of Middletown, re-elected president; John H. Gross, of the Scoville Manufacturing Co., Waterbury, vice-president; Robert C. Buell, of the Hart & Hegeman Manufacturing Co., Hartford, treasurer. Directors were elected as follows: Don H. Curtin, Willimantic; Frederick J. Kingsbury, of the Bridgeport Brass Co., Bridgeport; Oliver L. Johnson, of the Aspinook Company, Jewett City; E. A. Moore, New Britain; William Parks, of the Riverside Woolen Mills, Stafford Springs; Charles E. Treadway, of the New Departure Manufacturing Co., Bristol; Isaac M. Ullman, New Haven; and W. W. Wilcox, of Middletown. The meeting resolved itself into a realization of the serious nature of foreign competition in the manufacturing market, especially German, to which the Connecticut industries are subjected. Among the speakers were Walter Camp, president of the New Haven Clock Co., New Haven, who spoke on "American Valuation." He advocated the plan of assessing duty on imports (on value) estimated at the port of arrival, in American money in the country of production. Mr. Carl W. Ackerman, a war correspondent, spoke on "Germany's Economic Offensive"; Col. John Q. Tilson, spoke on Connecticut's industry in general.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
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As the business men of America take up the routine that was somewhat interrupted by the holidays, a tendency toward a more inclusive view of the world's affairs is apparent. The many leaders of industry, finance and commerce who expressed themselves in the newspapers at New Years were almost unanimous in predicting better times in the United States during 1922, but this prediction was in most cases conditioned upon the financial reconstruction of Europe and a recovery of her purchasing power.

As a result public attention in this country is being diverted from Washington and the Disarmament Congress to Cannes, where the Supreme Council of the League of Nations met last Friday. Although the United States is not a formal participant in this conference, our Ambassador to Great Britain, George Harvey, is present as an unofficial observer and American interest in the proceedings is very keen.

Numerous schemes for providing Europe with a stable currency and the credit that business requires will be discussed. Among them is the Ter Meulen plan, which seems to be highly regarded, but nearly all of them contemplate the creation of an international bank or something akin to it, whose capital shall consist of gold or other assets readily convertible. It seems to be assumed that a large portion of this capital can be obtained in the United States. As this is unlikely it is to be feared that none of the proposals put forward will prove to be workable.

But a partial solution of the problem presented is meantime being effected by the increasing use of the dollar as money is continental Europe. Returning travelers report that in Poland, Czecho Slovakia and parts of Germany the farmers are refusing to sell their produce unless they are paid in dollars and that in Paris the shopkeepers prefer dollars to francs for their goods. Coming nearer home, Cuba has no paper money and no bank notes except our own, and has not resorted to the printing press and to inflation to ease her economic distress.

To make the dollar a legal tender for debts already incurred in Europe is of course impracticable, but if new contracts expressed in dollars were legalized they would no doubt soon come into general usage and American money would speedily supplant the discredited paper whose fluctuations make foreign trade so difficult and hazardous.

The suggestion is not by any means fanciful for competent authorities estimate that many millions of our reserve notes are already held abroad and that in the form of dollar deposits the New York banks have custody of a very substantial portion of Europe's liquid capital.

Any great increase in the use of American currency in Europe would, of course, presuppose enlargement of its issue here, but our reserve ratio is so high that there is abundant room for expansion without inconvenience; and if the thousands of American tourists who will go abroad this summer or are already on their way to the Mediterranean resorts, understood that their dollars would buy as much as the equivalent in francs, lire or marks Europe would be automatically supplied with a large share of the good money it requires.

First place is given to a discussion of European conditions this week because they are likely to have a profound effect upon business in this country, both psychologically and physically. We are in good shape here but we produce more than we consume and unless we can sell our surplus production abroad at fair prices our farmers will suffer and their inability to buy will be felt all along the line. The news that a general moratorium is now being considered by the Italian government has therefore created some little apprehension in this country. The fear is that the distrust may spread and that other European countries may be affected. For this reason the Cannes conference is very opportune and it is to be hoped that it will act promptly and aggressively.

India and Ireland are two other sore spots in the overseas situation. De Valera is still blocking the ratification of the treaty offered by Great Britain, and Gandhi and his followers seem to be creating a great deal of trouble for the English in India. The resulting unsettlement need not, however, affect us directly except as all uncertainties make capital hesitate in undertaking new ventures.

The dullness of the stock market reflects the doubts that are felt with regard to the economic future of Europe, for certainly there is nothing in our domestic outlook to cause concern. The weekly statement of the Federal Reserve Banks shows a reserve ratio unchanged at 71.1 per cent and a gain of nearly $6,000,000 in the gold held.

Last Wednesday the new bond issues offered in New York totalled $76,447,000. They included $40,000,000 gold bonds of the Dutch East Indies put out on a 6.45 per cent basis, and $20,000,000 soldiers' bonus sold by the State of Ohio at prices which yield from 4 to 4.40 per cent. It is estimated that new bond issues amounting to more than $1,000,000,000 were brought out during the year and while much of this money was required to pay old debts or maturing obligations a large portion of it will be used for new construction which will give employment to millions of people.

Speculation is nevertheless dormant and the commodity markets show few changes. Cotton continues firm as the probability of another small crop becomes more generally appreciated. Woolen and cotton textiles are steady. The demand seems about equal to the supply. Sugar is attracting more attention at almost the lowest prices on record. It is a few points higher. Cuban advices say that a big crop next year is financially impossible as the planters cannot get the money required.

Reports from the steel industry are distinctly favorable and an increased production of pig iron is believed to presage a larger production of steel in the near future. The action of the General Motors Co. in passing the dividend on its common stock is variously construed. Some think it indicates that automobiles are still hard to sell while others claim that it reflects conditions that are peculiar rather than general. The truth seems to be that there is a good demand for low priced cars while those that are more expensive are slow of sale. Pennsylvania crude oil is down from ten to fifty cents a barrel and a proportionate decline in the mid-continent field is expected.

Railroad net earnings for November are nearly complete. They are much better than had been anticipated but the gain is chiefly due to the reduced cost of operation. December earnings are expected to be poor as those who could deferred making shipments until January when the repeal of the transportation tax and the reduction of about 25 per cent in the freight rates on food products in the trans-Mississippi territory became effective. We shall not know the facts until February, but many railroad managers expect a handsome increase in the traffic this month.

At the direction of the President, the Secretary of Agriculture has called an agricultural conference to consider the plight of the farmers. It will convene in Washington, probably on Jan. 23. Just what can be done at such a conference is not yet apparent, but it will at least quicken sympathy with the class who have suffered the most by the precipitate deflation and decline in prices.

These are the annals of a comparatively quiet week. In so far as they may be prophetically interpreted they indicate stability without excitement and increased activity when the long deferred hope of European recovery commences to be realized.

Steel Plant Coming Down

The enormous plant of the Chickasaw Shipbuilding and Car Co., near Mobile, Ala., constructed at a cost of several million dollars during the early part of the war by the United States Steel Corporation, is being dismantled. Of the plant proper only the acetylene gas plant and the million dollar electric power plant will remain when the present work has been completed. Officials are being transferred to other plants of the steel corporation.

Business Conditions in England

Outlook for 1922 Better In British Industry—Government Planning Financial Economy —Disarmament Having Its Effect—Machine Tools Quiet

BY OUR LONDON CORRESPONDENT

While there is not much that is material to justify it, the atmosphere appears once again to be clearing, this being due in a large part to the armament limitation congress at Washington, to the happier turn of affairs in Ireland, and to the fairly general feeling that questions of reparations, war debts and so on will at last have to be re-settled on a more workmanlike basis by international agreement. The steady rise in the New York exchange is ascribed not only to the Washington proceedings but also to Americans being more ready to use their money in Europe instead of importing gold, thus directly improving conditions on this side of the Atlantic and eventually in their own country. But the feeling grows that the load of debt weighing on all the lately-combatant countries of Europe will have to be re-adjusted, and for materialistic and other reasons Great Britain is quite ready to make sacrifices in order to get trade flowing again. The statement has often been made, in fact so often as almost to suggest a remote doubt about it, that this country, come what may, will pay her debts. Almost as frequently we are reminded that while we borrowed sums of the order of about 876 million pounds from America, we advanced to our Allies just a little more; and our Allies show very slight ability, or even disposition, to repay.

Production Increasing

The overseas trading of Great Britain, according to the latest return, does indicate some improvement, imports having increased in value during November as compared with the previous month by more than 4½ million pounds, while exports of British produce rose by more than half a million pounds; on the other hand re-exports fell by nearly the same amount. Of course, as compared with the same month in 1920 very marked declines in total values are shown in every direction, and this again is true when the eleven months of 1921 are compared with the same period of 1920, the imports having fallen, in value that is, by 44 per cent and exports of British produce by 48 per cent.

But for the time being the movement is in the right direction, and since the settlement of the coal strike last summer the output of British goods per working day has regularly improved month by month. Of course, there is a long way to go and imports out-value exports by about one million pounds per working day. Our imports may be regarded as steady. Exports are not of course the sole measure of productivity, and no real estimate can be made of the home trade. All the same, as far as they go the figures of export support what a number of employers have been stating of late, namely that the British workman is slowly but steadily putting his back into his business.

German reparations are causing as much trouble here as—probably more than—our debts elsewhere, and in response to the suggestion of Sir Peter Rylands that Germans should be allowed to build super-power stations in Great Britain, the Institution of Electrical Engineers has made a public protest. First of all on the general principle of reparations in kind the government is reminded of the extensive unemployment here, with the suggestion that any such reparations should be of a character not to compete with productions in Great Britain "involving employment on a great scale of labor, both skilled and unskilled." As to the special suggestion of large power stations, this, it is asserted, would lead to an additional amount of unemployment in the electrical trades, besides giving a world-wide advertisement to German goods, and, further "would fatally diminish the present prestige of British electrical goods, with most serious effects on our export markets."

British Economy

Besides the handicap to trade due to international debts, it is felt that few countries are making sufficient efforts to live within their means. Of European countries engaged, only Great Britain made any attempt by taxation to pay for the war while it was running. The two chief continental antagonists proceeded by way of loans, in the belief that the conquered enemy would have to pay for everything. After much talk a special committee has been sitting in Great Britain for the purpose of cutting-down expenditure. An interim report has just been made, but not published (a cut of £195,000,000 a year is suggested), and the final report will not be ready until the new year is fairly well advanced. In view of the reductions to be proposed in expenditure, it is anticipated with confidence that the income tax will be lowered next year, and newspapers have not been lax in asserting positively that the new corporation tax will disappear after a one-year run. As to the income tax, during the past six years this has raised something like £1,568,900,000, comparing with just under 271 million pounds for the six previous years. Heavy taxation is undoubtedly affecting enterprise adversely and now that profits are declining the disadvantage of assessment on the average profit of three years working is becoming obvious; though why this fact could not have been foreseen by so many people responsible for business affairs is rather surprising. The assertion has been made that payment of the tax now in many cases implies inroads into capital; thus in some instances at least a capital levy is already in operation.

Some firms have difficulty in meeting demands for excess profits duty and in response to pressure the Chancellor of the Exchequer has agreed to arrange definitely in his next budget for spreading the payment of outstanding arrears over a period of five years, payment to be made by quarterly installments, with interest at the rate of 5 per cent per annum without allowance for income tax. Special application will have to be made for this concession and the Chancellor is anticipating matters by instructing the officials concerned to give effect to the arrangement in advance. Here he may perhaps be on safer ground than was Lloyd George, when, as Minister of Munitions, he promised the machine tool makers special concessions in taxation, only to forget that the Chancellor of the Exchequer is responsible for the budget. But the concessions do not satisfy everyone. Some firms who have paid the duty complain that the new arrangement is not fair to them. Some add that the Chancellor was forced to make the concession by the fact that, if he did not, the firms concerned would go bankrupt and he might lose the whole of the money. It is perhaps an exaggerated view; in such cases the tax-collector has a very early claim on assets.

Another point is that before a real trade revival is possible railway rates must be lowered and prices generally, and especially of coal, must be still further reduced. The average drop in the price of coal during the current year is estimated at 13s 6d a ton. It is mainly in steam, gas and bunker varieties, household coal showing little change. The retailer has come in for much criticism, not without effect, and as the cost of living is reduced—according to the latest available official estimate it is 99 per cent above pre-war cost—many wage reductions occur automatically and others can be pressed for on the ground of equality. Indeed the council of the trade union congress has just issued a manifesto which asserts that wage reductions effected last year reached £286,000,000. But this figure, if correct, relates to wage rates, not wages.

Production Costs Increasing

On the other hand, against it has to be set the fact that, according to Lord Weir's estimate, increased costs of production in Great Britain in 1920 due to the lessening of hours of working, etc., exceeded £200,000,000. Workers, or at least many of them, hold the view that employers have entered into a conspiracy to reduce wages and to lengthen drastically the working week. The council issuing the manifesto asserts this, "from the evidence submitted to us." But any such general combination of employers for that particular purpose is extremely unlikely. Reductions in wages are being forced solely by circumstances. The fact that for some time past Great Britain has had an army of unemployed drawing on public funds to numbers approaching two million, with more than a quarter of a million on a reduced working week, should be almost sufficient evidence.

The executive council of the Amalgamated Engineering Unions evidently

appreciate the gravity of the situation. Indeed they admit it, in view of the fact that more than 92,000 members are out of work. They therefore urge the members to ratify the provisional agreement reached with the employers on freedom of management and overtime matters; in fact the council suggest that failure of the workpeople to agree will probably mean a national stoppage of the industry on the part of the employers. The membership of the union is 430,000, or 30,000 less than at the beginning of 1921, and more than 25 per cent are unemployed.

The problem of the out-of-work has been especially acute in the midland areas, and rest rooms for unemployed men have been instituted in Birmingham, while lately one for women and girls has also been opened. The men's rooms are available all day and are controlled chiefly by committees of the unemployed themselves. More women's centers will be established in this year, the ordinary proceedings including evening concerts, games, etc., and the supply of cheap refreshments.

Effects of Disarmament

The negotiations at Washington had effect on the market prices of shares of the armament firms and indeed caused some little depression in other quarters. For although the production of armaments is certainly not to the advantage of the nation, some interests must be affected adversely. Firms outside regular armament circles who were to have supplied material, etc., for new capital ships had already named their particular vessel "Godsend," and it was partly because of the suspension of Admiralty orders that W. Beardmore & Co., Ltd., Glasgow, decided to pay no dividends recently. The accounts for the five years ending with 1920 show an aggregate profit of £2,411,021, separate accounts for each year not being available. After payment to preference shareholders, placing a million pounds to the general reserve, etc., the ordinary shareholders receive nothing; in fact they have been without a dividend since 1918, the directors last year carrying forward £711,909.

Vickers, Ltd., Sheffield, holds half of the ordinary capital in the Glasgow concern and provides two directors. It happens that Vickers, Ltd., has just issued a report for the year 1920; here again no dividend is to be paid on the ordinary shares. The profit for the year was £541,300, and after payment of preference dividend, etc., a balance of about £145,300 is to be added to the balance brought in, the carry forward being £991,639. The share capital issued of this company is £20,678,400, with £2,770,200 in debentures and notes. The value of material and work in progress shows a slight reduction and is put at £3,481,600. This is in the company's own works and does not take in the work of the subsidiary companies, in which Vickers, Ltd., is interested to the extent of £18,076,600. It may be added for comparison purposes that against the sum for 1920 of £541,300, the profits amounted to a total of £4,493,700 for the four previous years.

The Sheffield concern of Brown, Bayley's Steel Works, after including the balance brought forward and interim dividends paid, shows a balance on revenue account of £29,457. This firm is preparing stainless iron or mild steel, some half a dozen brands of which are now on the market. Dorman, Long & Co., Middlesbrough, iron and steel producers, etc., paid 5 per cent free tax on their ordinary shares, or half the dividend distributed last time. The accounts show profits for 1920 of £413,799. The ordinary shares amount to some six million pounds, out of a total issued capital of 7½ million pounds.

Machine Tools Very Quiet

The motor car and cycle industry may have received somewhat of a fillip from the Olympia shows, but this has not led to any great expansion in the call for machine tools, and the machine tool industry is as depressed as ever. A deputation from the Machine Tool Traders' Association recently drew attention to the large stocks of tools still held by the government, valued at £2,000,000 and upwards; the proceedings were private and apparently no conclusion was reached. Recent voting in the association in connection with the proposal to bring machine tools within the second part (prevention of dumping) of the Safeguarding of Industries Act and thus make them liable to duty resulted in less than 100 being in favor, a quarter the number against, a handful neutral, while the remainder did not vote.

A statement of affairs of the Universal Machinery Corporation, Ltd., London, E. C., now in liquidation, shows on the one side unsecured creditors at £120,892, while the chief item on the assets side is stock of machinery, some of which is understood to be in France, valued at £50,000. The net result is a deficiency of £73,675 to meet claims of unsecured creditors, subject to costs of liquidation. The share capital, authorized, issued and fully paid up is £20,000.

Some Firms Prospered

Among motor car firms Humber, Ltd., Coventry, seems to have done very well, the turnover in 1920, in face, constituting a record, with profits amounting to nearly £104,000, or almost the same as for the previous year. D. Napier & Son, Acton, W., also made a good return, showing a net profit of £79,099 against a loss the previous year of £59,541; no dividend is being paid on the ordinary shares and the directors are being reminded that good will is valued at £300,000. W. H. Dorman & Co., Stafford, associated with the motor car industry as manufacturer of motors, shows in the report for the year ending with July, 1920, a trading loss of £309,363, compared with a profit of £72,980 the previous year. After allowing for payment of preference dividends, etc., the debit balance is £186,000. The directors state that at the end of last year the company had booked orders worth approximately £700,000, mainly for the Dorman engine, but the major portion of these orders had to be suspended or cancelled as customers could not take delivery or pay. Rudge, Whitworth, Ltd., Coventry and Birmingham, again paid 10 per cent free of tax on the ordinary shares, but presents no statement of accounts; no balance sheet, in fact, has been available since 1915. It is reported that the Triumph Cycle Co., has bought up one of the Coventry motor concerns and will manufacture a four-seater car.

Trend of Business Improvement—Plants Resuming

The Imperial Wheel Co., Flint, Mich., manufacturer of automobile wheels, has resumed full production at its plant. The company is said to have orders on hand for more than 75,000 sets of wheels.

The Bourne-Fuller Co., Cleveland, Ohio, has resumed production at its Upson nut works, giving employment to about 800 operatives. A wage reduction of 15 per cent has been made at the plant.

The Ingersoll-Rand Co., New York, is maintaining the full-time operating schedule at its West Easton, Pa., plant.

The Missouri-Pacific Railroad Co., St. Louis Mo., has re-opened its repair shops at Sedalia, Mo., giving employment to about 1,400 operatives.

The Chief Motors, Inc., Port Huron, Mich., recently merged into the Whitney Tractor Co., with kindred interests, is arranging for increased operations at its plant to develop an output of 100 tractors daily. Additional equipment will be installed at once.

The Bessemer Gas Engine Co., Grove City, Pa., is increasing operations at its plant and will soon inaugurate a full production schedule.

The Missouri, Kansas & Texas Railroad Co., St. Louis, Mo., has resumed operations at its shops in the vicinity of Sedalia, Mo.

The Jewett Phonograph Co., Allegan, Mich., manufacturer of talking machines, has increased its working force to over 100 men, with working schedule advanced from 10 to 13 hours a day.

The Jenkins Brothers Co., Bridgeport, Conn., manufacturer of valves, is maintaining active production at its local plant and distributed a bonus of 5 per cent to employees on Jan. 1.

The Carbon Iron and Steel Co., Parryville, Pa., is arranging for the resumption of operations at its plant, following a shut-down for the past six months. Repairs and improvements were made to equipment.

The Rochester Can Co., Rochester, N. Y., distributed a bonus totaling $26,000 to its employees during the holiday season. Active production is being maintained at the plant.

The Delaware, Lackawanna & Western Railroad Co., is operating its shops at East Buffalo, N. Y., on full time. with a normal working force of about 1,000 men.

The Lockwood Manufacturing Co., Norwalk, Conn., manufacturer of hardware products, has recently resumed operations on a full time schedule, giving employment to about 700 operatives.

The Westinghouse Electric and Manufacturing Co. has placed two additional plant units in operation at its East Pittsburgh, Pa., works.

The Baldwin Locomotive Works, Philadelphia, Pa., is maintaining an active working schedule, giving employment to about 7,500 men, and expects to maintain this basis of production throughout the winter.

The A. B. Stove Co., Battle Creek, Mich., manufacturer of gas ranges, is operating at full production, with the largest output ever maintained at the plant.

The American Car and Foundry Co., New York, has received a contract for twenty-five all-steel passenger cars

from the Manhattan Railroad Co., New York. The work will be handled at the Berwick, Pa., plant of the company.

The American Locomotive Co., New York, has taken contracts for twenty-five heavy-type Mikado locomotives from the Central Railroad of New Jersey.

The Algoma Steel Corporation, 120 Broadway, New York, operating in the Lake Superior district, has taken an order for 15,000 tons of steel rails from the Canadian National Railways Company.

It is reported that the General Electric Company's plant in Pittsfield, Mass., has received another large order from Japan, for power transformers and lightning arresters. Transformers are to be of a capacity to generate 150,000 volts and transmit current 150 miles. This, together with substantial orders from the Alabama Power Co. and the Southern Power Co., of South Carolina, assures an expansion of the plant's operations by February.

The Smith & Wesson Co., Springfield, Mass., is installing new machinery, and the prospect is that the plant, closed since last summer, will resume operations soon.

Chamber of Commerce to Aid Study of Depreciation

Practical studies by the various industries for the purpose of ascertaining within each industry a normal rate of depreciation on buildings, machinery, etc., which may be used as a basis for reckoning depreciation in individual plants, are urged by the Fabricated Production Department of the Chamber of Commerce of the United States. Such studies have the approval of the United States Treasury Department.

It is not the purpose to create within any industry an inflexible standard rate of depreciation for the buildings, machinery, etc., of each unit within the industry, but it is proposed to set up something that may be used as a guide to fit usual conditions, as explained in a bulletin in which the Fabricated Production Department puts forward its recommendation.

There are certain conditions affecting the wear and tear upon buildings and machinery that are similar in most of the plants within any industry, it is declared. If these uniform conditions are taken into account in arriving at depreciation rates which are to be charged, it is much easier, it is held, for members of the industry and treasury officials to agree on rates than when no basis at all is set up.

The Fabricated Production Department of the national chamber has been working on this particular problem for some time. The announcement which it makes in its bulletin that the Treasury Department approves investigation and study along the lines suggested will be of unusual interest to business men, particularly manufacturers, who have wrestled with this question of proper rates to charge for depreciation. Manufacturers have recognized that different conditions obtain in the different industries and that depreciation is much greater in certain lines. It is clear for instance that depreciation on buildings used in the manufacture of steel products, foundries, etc., is greater than on buildings used for the manufacture of fine textile goods.

Government Officials and Manufacturers Urge Extension of Work of Screw Thread Commission

In all probability Congress will extend the term of the National Screw Thread Commission for a period of five years, from March 21, 1922. The matter is now being considered by the Committee on Coinage, Weights and Measures of the House of Representatives. No opposition to the proposal has been voiced and it is believed that the resolution, to the foregoing effect, which was introduced by Representative Tilson of Connecticut, will be passed.

Since the issuance of its report on screw threads, the commission has been urged to extend the work with the idea of standardizing heads of bolts and nuts, heads of screws, and the wire sizes. Col. E. C. Peck, of Cleveland, Ohio, who is a member of the Screw Thread Commission, testifying before the House Committee, stated that there are seven distinct systems in use in the United States for measuring wire sizes. He declared it would be a great benefit to the entire manufacturing industry if the commission can establish a system of wire gage numbers that will suit all purposes and be standardized in the same way screw threads have been standardized. Col. Peck told the committee that there had been no complaint from manufacturers as a result of the effort to standardize screw threads and pointed out that the Association of Screw and Nut Manufacturers, which includes fifty-seven manufacturing concerns, adopted the commission's report unanimously. He said that the demand for the extension of the work of the commission comes more insistently from manufacturers than from the consumers of their products.

In emphasizing the importance of exact fits in screw threads, Col. Peck cited the consequences which followed the breaking of a bolt when England and the United States were competing in an effort to cross the Atlantic Ocean in an airplane. England would have won that honor had our standard of screw threads been in use in that country, as the failure was caused by too great an initial strain on the bolt

The value of the screw thread report, Col. Peck pointed out, may be judged from the fact that the whole principle has been adopted in Germany.

Commerce Secretary Hoover appeared before the committee and urged that the benefits which had followed the simplification and standardization of screw threads be extended. He pointed out that "it has become more necessary than ever before, with the disparity between distribution and production costs, to resort to simplification of matters of this type. The most pregnant field I know in which something can be done toward restoring the relativity of production and distribution, is that we do not produce such a tremendous variety of goods. Then we are not compelled to carry such quantities of materials in stock. We do not have so much waste through misfits and other losses of that type. This commission has demonstrated that it is possible to get co-operation between manufacturers and engineers. With our very strongly individualistic manufacturer, the tendency is to establish little qualities about his own dimension that will hold his particular trade. But generally the manufacturing industry has taken a wider view and is prepared to co-operate in such matters."

Major J. O. Johnson, of the Ordnance Department of the Army, referred to the commission's report as "the universal language on screw threads." In the manufacture of 75-mm. shells during the war, it was necessary to deal with various tolerances, he said, until there were twenty-eight different sizes applying to the fuses which were screwed into the shell. This now has been worked down to six sizes and by working through this class of fits he expects to get it down to less than that. The fact that manufacturers now have to have only six sets of taps and six sets of gages instead of twenty-eight, means a tremendous saving, he pointed out. He cited, as an instance of the difficulties which arose prior to screw thread standardization, the experience of ships in American harbors. Due to the variety of threads on hydrants, it would be necessary for the ship's machine shop to make a coupling at nearly every port before it could hook onto a hydrant to get water.

When the Washington fire department was sent to Baltimore to help fight the great fire in that city, Washington hose and other apparatus could not be coupled up in Baltimore due to the difference in thread. This instance was referred to by Major Johnson as one of the most striking instances of lack of standardization of screw threads. By following the present standardized system, there is no confusion. A tap can be bought in San Francisco and the die in New York. He explained that the commission wishes to extend its work to the standardization of taps and tools and the acme thread remains to be standardized.

Machine Tool Exhibit in Japan

The manufacture of machine tools in Japan has undergone gradual development during the past twenty years. The period of the war saw the greatest expansion, due mostly to the high price of imported tools and the difficulty of transporting them. This gave Japanese manufacturers the opportunity to perfect their designs and expand.

Since the armistice the general depression has had its effect upon the machine tool trade. Manufacturers took this as an opportune time to arrange an exhibit and it was held at Osaka from Oct. 22 to Nov. 30, last year. The show was a great success, practically all the large builders of tools in Japan taking part. Prominent exhibitors were the Ikegail Iron Works, Karatsu Iron Works, Niigata Iron Works, Locomotive Works at Osaka and the Gas and Electric Works at Tokio.

Russia Introduces the Metric System

According to a decree of the Peoples Commissars, published in official soviet papers, the metric system of measures was introduced in all soviet institutions beginning Jan. 1, 1922, and from 1924 the metric system of weights and measures must be finally and universally adopted throughout Soviet Russia.

Special Meeting of Manufacturers To Discuss Tariff

To crystalize and give expression to the manufacturing opinion of the country respecting the vital principle of tariff administration and the need for early action upon tariff legislation in the public interest, it has been determined to call a convention of American manufacturers under the auspices of the National Association of Manufacturers to meet at the New Willard Hotel, Washington, D. C., on Monday and Tuesday, Jan. 30 and 31.

A referendum vote of the association has just been taken to determine whether or not the membership approves the proposal to insert the principle of "American Valuation" in any tariff bill which may be enacted. The membership vote disclosed 77.7 per cent favorable to American valuation, 20.7 per cent unfavorable, and 1.6 per cent of the ballots cast were defective. This meeting has been called as a means of forming intelligent public opinion upon the vital subject at issue, acquainting Congress with the viewpoint of industrial business and securing the earliest practical action toward a stable public policy. Further information of the meeting can be obtained from the secretary, George S. Boudinot, 50 Church St., New York City.

Farm Machinery Finds Favor in Chile

American farm machinery formed an important part of the exhibits at the agricultural show held during the last week of October in Santiago, Chile, by the National Society of Agriculture. This indicates a tendency toward the employment of modern equipment, obtained chiefly from the United States, according to a report from Charles A. McQueen to the Department of Commerce. American plows, cultivators, drills, mowers, binders and binder-thrashers, together with traction engines, both American and British, and thrashers, chiefly American, formed the bulk of the machinery on view.

In the more highly specialized products American manufacturers had little competition. The American reaper-thrasher was the object of much interest and this machine is particularly adaptable to conditions in the south of Chile, the principal wheat-growing district, because the copious rainfall requires rapid action on the part of the farmer so that the grain may be harvested and thrashed between the frequent showers, when conditions are favorable.

The market for modern agricultural machinery in Chile is limited by two factors—the cheapness of labor and the lack of a steady export demand for the agricultural products of the country. This exhibit has shown an increasing interest on the part of the Chileans in modern farm equipment. A return to normal conditions will undoubtedly witness an increased demand for American agricultural machinery.

Among the lighter tools and implements exhibited were articles manufactured locally. Dairy machinery and light flour mills of American manufacture were rather scarce, these products coming most from Sweden, where the exchange rates permit of lower prices than we can compete with.

Major Hoke Addresses New Britain Section, A. S. M. E.

Major W. E. Hoke, formerly of the Bureau of Standards at Washington, addressed a gathering of about 200 members and friends of the New Britain Section, A. S. M. E., assembled at the plant of the New Britain Machine Co., on the evening of Tuesday, Jan. 3, 1922. His subject was "The Millionth of an Inch."

Major Hoke's wide experience in the development and manufacture of precision gages renders him peculiarly adapted to bring home to his hearers the possibilities in the way of accurate measurements by the use of such gages. Lantern slides of the gages, the machinery used in their manufacture, and some of the many ways in which they may be applied to modern production methods were shown on the screen.

The speaker exhibited gages, squares, surface plates and similar tools that were claimed to be accurate to within a few millionths, and demonstrated in an interesting manner how surfaces of the utmost precision were produced upon machines far less accurate than themselves by the application of the principle of the "symmetrical distribution of errors."

The theory of the interference of light waves was explained and the manner in which the color bands of the interferometer were applied to the checking of accurate measurements.

New England Foundrymen Dine and Frolic

The twenty-sixth annual meeting of the New England Foundrymen's Association was held in the Exchange Club, in Boston, on the evening of Jan. 11. A large crowd of members and friends attended the festivities, which were garnished with a program of entertainment seldom provided at such affairs. The Foundrymen's own orchestra supplied the music for the occasion. A vaudeville show with a variety of performers made the evening a most enjoyable one.

The election of officers for the ensuing year resulted in the selection of E. H. Ballard, of the General Electric Co., Lynn, Mass., as president. Other officers chosen were: George A. Ray, Taylor-Fenn Co., Hartford, vice-president; H. H. Gibby, Gibby Foundry Co., Boston, treasurer; and Fred F. Stockwell, Barbour-Stockwell Co., Cambridge, secretary.

Charles A. Reed, chairman of the executive committee, arranged the details of the meeting.

November Exports of Motor Vehicles

With the exception of motorcycles, exports of motor vehicles during November show a decrease from the exports of the previous month, says the Department of Commerce. Passenger car shipments were one-tenth smaller in number, while motor trucks showed a decrease of more than one-fourth. Motorcycle exports increased 13 per cent in number. A slight increase in the unit value of passenger cars is evident and a considerable decrease in the unit value of motor trucks exported—12 per cent as regards complete trucks, and 43 per cent as regards chassis of trucks.

Gov. Harding on Exchange and Tariff

Foreign exchange and the export situation were referred to in a recent public address by W. P. G. Harding, governor of the Federal Reserve Board.

He said that judging from our own history after the Civil War, many years will doubtless elapse before some European countries can restore the normal value of their currencies, but if the violent fluctuations in exchange which have marked the past two years can be prevented in future and a stabilization on some basis accomplished, it will be possible to engage in commercial and financial transactions with Europe on a much larger scale than at present. If we wish to sell our surplus products abroad, it is evident that we must continue to exchange commodities with foreign countries, for where we sell we must buy. A curtailment of production to meet merely American requirements would involve wide-spread unemployment and would invite disaster. On the other hand, because of the great depreciation in the currencies of many foreign countries their labor costs are much less than ours and partly because of this fact and partly because of the high premium on dollar exchange, they are able to undersell us in our own markets.

One of the great problems of our national legislators today is to frame a tariff which will prevent the dumping upon our markets of foreign goods, without at the same time erecting a tariff wall so high that our exports will be greatly reduced because of the inability of foreign nations to trade with us.

Japan Shows Slight Improvement in Trade

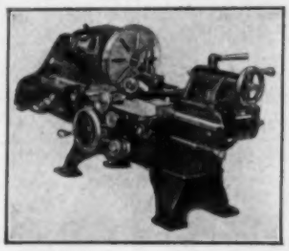
There has been little change in the general economic conditions of Japan since Nov. 15, according to acting commercial attaché H. A. Butts, of Tokio, to the Department of Commerce. Except some increased activity in the cotton yarn, raw silk, silk textile and rice markets, trade and industry in other lines remain depressed. Heavier railroad traffic during November, a more active demand for shipping space, the chartering of more small vessels, however, are hopeful signs of increasing business. Postal and savings deposits have decreased, bank rates increased and money is somewhat tighter but that is quite natural in view of the general custom to settle all outstanding debts before the beginning of the new year. The government reports expenditures in excess of revenues for the period from Jan. 1 to Oct. 1.

Although there will probably be some improvement in the export trade in December, through increased exportations of silk, cotton yarns and textiles, it does not seem probable that the increase will be sufficient to equal the probable imports for that month and the year will undoubtedly close with an excess of imports over exports of about 360,000,000 yen, compared with a similar unfavorable trade balance last year of 388,000,000 yen. While the balance is less this year than last, the ratio of the balance to their exports is considerably greater. However, the outlook for 1922 presages a larger export and import return.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Lathe, Engine, 9- and 11-In., "Junior"
Monarch Machine Tool Co., Sidney, Ohio.
"American Machinist," August 25, 1921.



The lathe is made in both 9- and 11-in. swing, in bed lengths from 2½ to 5 ft., and in either bench or floor models. The headstock is of the bowl type, and is equipped with a three-step cone pulley and single back gears. The bed is made of semi-steel. Longitudinal and cross feeds are provided. The machine can be furnished with either full or semi-quick-change gear box, 54 feeds and threads being obtainable with the former and 3 quick changes with the latter. Taper, turret and draw-in attachments, chasing dial and stop, oil pump and individual motor drive can be furnished.

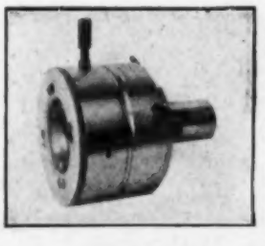
Car, Shop, Electric
Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.
"American Machinist," August 25, 1921.

The machine is intended to provide quick and convenient inter-shop transportation. The wheelbase of the car is 65 in., and the tread is 35 in., so that the machine can pass through most shop doors and aisles. The car has a cruising radius of fifty miles on one charge at a speed of 15 miles per hour, and a load capacity of 500 pounds. It is said that the cost of recharging the batteries is but a few cents per day. Charging apparatus can be furnished.

Gages, Plug, Thread, Reversible
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," August 25, 1921.

These reversible, thread, plug gages are made in all sizes above ¼ in. "No go" and "go" ends are interchangeable with the cylindrical plugs, and either long or short lengths can be used. Rigidity between the gage and the handle is said to be assured by the use of the tripod support. At *A* and *B* in the illustration are shown the standard type of reversible end gages. At *C* is a "protected master," so called from the fact that it is impossible to screw it into a hole. *D* is a plug for setting thread gage templets. *E* and *F* show the non-reversible type of thread plug gage.

Die-Head, 2½ in., "Coventry"
Alfred Herbert, Ltd., Coventry, England, and 50 Church St., New York, N. Y.
"American Machinist," August 25, 1921.

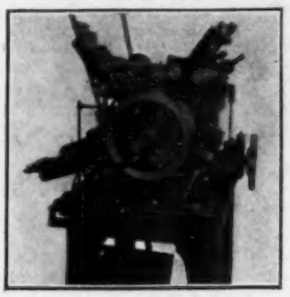


The die head is intended for cutting fine threads, being lighter than the standard one of the same nominal size. The action is the same as in the head described in the *American Machinist* on April 15, 1920. It will cut threads on rods from 1¾ to 2½ in. in nominal size. The maximum length threaded using the standard shank is 2½ in. The shank is removable, permitting the use of an adapter and allowing the work to pass through it, so that any length can be cut. Weight, 23 pounds.

Connecting-Rod Machine; Babbitting, Boring and Straightening; Weber
Sawyer-Weber Tool Manufacturing Co., Los Angeles, Cal.
"American Machinist," August 25, 1921.

The bed of the machine consists of a face-plate on which may be located the clamps, V-blocks, boring tool and other equipment. It is said that with this machine an operator can babbitt a connecting-rod bearing, straighten the rod and bore the bearing to size. The rod is held both by a wristpin through the small end, and in a support which has two setscrews in the top for clamping the rod. One formed cutter is used for the entire operation of boring, facing and filleting. A piston can be clamped to the side of the plate and held there for reaming the crosshole. It is possible to test the connecting-rod and piston assemblies for straightness, by rearranging the equipment.

Drilling and Tapping Machine, Automatic, Spoke-Nipple
Langelier Mfg. Co., Providence, R. I.
"American Machinist," August 25, 1921.



This is a special machine for the rapid drilling and tapping of the spoke-nipples used in automobile wheels. The nipples are held in lots of five in five different positions on the surface of the drum in the center of the machine. Corresponding to these five positions are five heads carrying the tools for the different operations. With each movement of the drum, five completed nipples are ejected from the machine, the production being stated as 120 nipples per minute. The machine is almost entirely gear driven. It is equipped with automatic stops which suspend its operation if tools are broken or work misplaced.

Arbor, Grinding and Relieving
Kelly Reamer Co., 3705 W. 73rd St., Cleveland, O.
"American Machinist," August 25, 1921.

This arbor is for use in grinding the cutters of "Kelly" reamers. The center bar of the reamer is placed in the arbor, as shown at the left, and is located centrally by a lug entering a slot on the bar. The arbor is furnished with hardened end plugs. It is used in a cylindrical grinding machine between centers, where it is oscillated by hand while the grinding wheel is passed across the face of the cutter. Plugs with offset or eccentric center holes are used, the result being that the cutter is not only sharpened but relieved as well.

Fixture, Grinding, Angle, Universal
Kelly Reamer Co., 3705 West 73rd St., Cleveland, O.
"American Machinist," August 25, 1921.

The fixture is intended for grinding the nose angles on cutters for reamers, and also for grinding lips on the cutters to give them top rake. The illustration shows the latter operation, using a formed wheel. For grinding nose angles, the fixture is turned approximately 90 deg. in a horizontal plane and a cup wheel used. The fixture can be completely revolved in a horizontal plane, and also set to all necessary vertical angles. Provision is made for centrally locating the cutter bar in the fixture.

Clip, paste on 3 x 5-in. cards and file as desired

Colorado Commission to Develop Water Power

President Harding has appointed Secretary Hoover as federal chairman of the Colorado River Commission recently created jointly by Congress and the seven states traversed by the river. The appointment has been made with the approval of the Governors of the states concerned. The creation of this commission is the first step in what promises to become one of the greatest of our national improvements, involving over a term of years an expenditure of several hundred millions of either public or private funds. Each of the States of California, Arizona, Nevada, Utah, Colorado, Wyoming, and Montana, is interested in the irrigation and power to be derived from the river and considerable conflict has already developed. Unless the river problems are considered as a whole there is likely to be a great waste both in water and power, through private or public grabbing or ill-considered plans, with much conflict both between the states and with private interests.

The land under irrigation in 1920 from the river and its tributaries amounted to about 2,464,000 acres in the United States and 190,000 acres in Mexico. If the river were equipped with proper storage dams the amount of irrigated land could be increased to about 6,123,000 acres in the United States and 800,000 acres in Mexico.

There is practically no power developed on the river at the present time, but it has possibilities of developing six million horsepower as an incident to development of irrigation storage. Some of this horsepower is urgently needed at the present time in Southern California and Arizona.

Foundrymen to Prepare Technical Papers

Technical subjects to be covered by members of the research committee of the Southern Metal Trades Association, a committee established by the organization some weeks ago to set a certain high standard for the manufactured products of Southern foundries and machine shops that are included in the membership, have been announced as follows:

By W. W. Stone, of the Wilmington Iron Works, Wilmington, N. C.; (1) The Physical Specifications of Gray Iron Castings; (2) Coke.

By John S. Schofield, of the Schofield Iron Works, Macon Ga.; (1) Chemical Specifications of Gray Iron Castings; (2) Finish of Castings.

By T. H. Siddall, of the Sumter Machine Co., Sumter, S. C.; (1) Mixing of Iron by Analysis; (2) Molding Sand; (3) Core Sand and Venting.

By J. R. Hedges, of the Casey-Hedges Co., Chattanooga, Tenn.; (1) Cupola; (2) Blast Pressure.

As soon as these subjects have been prepared they will be issued by the association in mimeographed form and distributed to all members, and it is later the plan to publish the entire series in book form. Each subject is covered by a man particularly fitted for it and recognized as one of the leaders in the metal trades industries of the Southern field. William E. Dunn, Jr., of Atlanta, secretary of the association is in charge of the distribution of the papers.

Metal Trades of South See Bright Future

The year 1921 came to a close with the metal trades industries unusually active in the Southeast, especially in the Alabama district. Production is far in excess of its total four or five months ago when it had reached about the lowest ebb of the year. Conditions began to gradually pick up about the time cotton went up in the early part of October, and during November and December the improvement was more rapid. The outlook for 1922 is unusually bright. In Georgia, South Carolina and Tennessee foundry and machine shop conditions have improved somewhat during the past three months, but do not compare with the outlook portending more rapid improvement early this year. In Alabama conditions are rapidly approaching normal, while there has also been material improvement in Louisiana and Mississippi.

Excessive freight rates at this time appear to be one of the main factors retarding industry's more rapid advancement, but it is generally believed in the Southeast that lower rates will probably be in effect by next April.

Business Items

The Standard Machinery Co., 453 Chapel St., New Haven, Conn., new and used machinery dealer, has recently changed the name of the company to Machinery Dealers, Inc. The personnel of the firm remains the same.

The Watrous Engineering Co., Inc., 211 State St., Bridgeport, Conn., was incorporated in December in the State of Connecticut to deal in machinery, tools, etc. The capital stock is $25,000. The incorporators are J. A. Watrous, M. Watrous and H. M. Hanks.

Beginning Jan. 1 the process engineering department of the Bridgeport Brass Co., manufacturers of brass goods, Bridgeport, Conn., will be absorbed by the research engineering department. Both will be under the supervision of William R. Webster, vice-president of the company.

The Nanbestos Products Co., of New Haven, Conn., was recently organized and incorporated under the laws of the State of Connecticut, to engage in the manufacture of hardware and asbestos products. The capital stock is $20,000. The incorporators are William Nanfelt, 156 Atwater St., New Haven; Ernest F. Nanfelt, and T. F. Reilley, also of New Haven.

The Danbury Mill Supply Co., Inc., of Danbury, Conn., was incorporated in December filing a certificate with the Secretary of the State of Connecticut, to engage and deal in machinery, etc. The capital stock is $25,000. The incorporators are; Winfield S. Holman, 35 Liberty St., Danbury; G. A. Seagraves, Providence, R. I., and H. Holman, of Danbury.

The Kraut, Brenton & Salvucci Co., Inc., toolpost manufacturer, Bridgeport, Conn., recently incorporated, has changed the name of the company to the Universal Tool Post Co., Inc.

The Industrial Supply Co., Inc., 464 Chapel St., New Haven, Conn., has recently been incorporated to deal in mill supplies, machinery, etc. J. F. Toole, 144 Townsend Ave., New Haven, is president and secretary; James F. Toole, New Haven, is the vice-president and treasurer.

The English & Mersick Co., Winchester Ave., New Haven, Conn., manufacturers of hardware, etc., has recently filed a certificate with the Secretary of State of Connecticut, increasing the capital stock from $300,000 to $500,000.

The Segal Metal Products Co., manufacturer of locks and hardware specialties, recently purchased the foundry of C. A. Lund, at Springdale, a suburb of Stamford, Conn.

The Fitzgerald Forging and Heat Treating Co., Springfield, Mass., has just been organized and will operate a plant at 576 St. James Ave., in that city. M. V. Fitzgerald and Thomas J. Fitzgerald are the partners.

The tool and machines shops of the New England Tank and Tower Co., Main St., Everett, Mass., were recently burned in a fire which occurred the latter part of December.

The Nickel Engineering Works, of Saginaw, Mich., manufactures of agitator equipment for chemical tanks, has leased a portion of the Schemm Brewing Co. plant, 920 North Hamilton St., for machine shop purposes.

The H. O. F. Motor Manufacturing Co. has been established at Cleveland, Ohio, with a capital stock of $100,000. Directors are W. T. Holliday, A. B. Oakes, M. F. Hanning, W. A. McAfee and C. M. Buss.

The Wainwright Engineering Corporation of Connersville, Ind., has combined with the McQuay-Norris Manufacturing Co., of St. Louis, Mo. The new organization will do business under the latter name. Harry A. Wainwright is manager of the company.

The Southern Berkshire Power and Electric Co. has completed its 700-ft. dam at Rockdale, Mass. A powerhouse has been built and a penstock and waterwheel installed for the development of 600 horsepower. The plant will be ready for operation in February.

The Gem City Machine Co., Dayton, Ohio, has increased its capital stock to $225,000. The company manufactures airplane motors and special machinery.

The plant of the Lowell Aircraft Co. was destroyed by fire. The loss is estimated at $250,000.

The Combustion Engineering Corporation, of New York, has opened a branch office at 806 First National Bank Bldg., Pittsburgh, Pa. This office will be in charge of W. C. Stripe.

W. B. Stratton, of New York, and H. W. Champion, of Philadelphia, have been appointed receivers for the White Roller Bearing Co., of Philadelphia.

The Paragon Tool Co., of Seattle, Wash., has been appointed as distributor, in the Northwest, of Deluxe lightweight gray-iron pistons, which are manufactured by the Clark-Turner Piston Co., of Los Angeles, Cal.

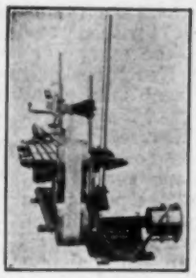
The Reading Machine and Tool Co. is the new name of the Reading Machinery Exchange of 437 Washington St., Reading, Pa. The change took place on Jan. 1. There will be no change in ownership or management.

The Seifreat-Woodruff Co., Dayton, Ohio, has closed a most successful exhibit of machine tools in operation. The show was held from Dec. 12 to 31

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Sanding Machine, Belt, No. 126
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," September 1, 1921.

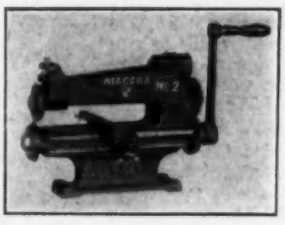


The machine is intended for the rapid sanding and polishing of all kinds of metal parts. As shown, the machine is set up so that there is no overhead belt. The slack in the sanding belt is automatically taken up, the idler being adjustable vertically. The table is 32 in. wide and 96 in. long, and equipped with an adjustable bar to hold the work. The equipment consists of one sanding shoe, wrenches and edging attachments. The table travels 36 in. and has a vertical adjustment of 14 in. Sanding belts up to 10 in. wide may be used. Weight, 1,400 lb.

Milling Machine, Die
Johnson Tool Co., 201 Eddy St., Providence, R. I.
"American Machinist," September 1, 1921.

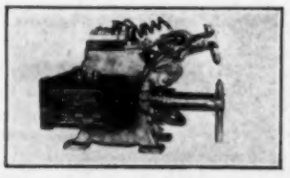
This die-milling and cutter-plate machine is intended especially for use in the manufacture of punching dies and hubs. The machine is provided with a tilting table, which has a capacity of 9 in. when not fitted with jaws. The machine has two spindles, one carried under the vise table and the other above. The head in which the upper spindle is carried can be swung out of position when not in use. The crossfeed is 4 in. and the lateral feed 6 in. The height from the floor to the top of the table is 40 in. Weight 600 lb.

Gage, Slitting, Rotary Sheet-Metal Shear
Niagara Machine & Tool Works, Buffalo, N. Y.
"American Machinist," September 1, 1921.



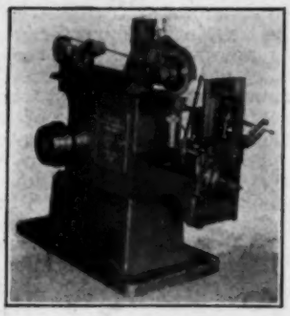
The gage is shown applied to the No. 2 rotary sheet-metal slitting shear, its purpose being to provide a simple means of guiding work through the shearing machine. The gage is easily adjusted, being held in alignment by the guideway. When the nut is tightened on the lock-bolt, the gage is locked firmly in position. The No. 2 slitting shear shown has been re-designed, and is now a miniature of the heavy slitting shear made by the concern.

Welding Machine, Spot, Bench-Type, S-4-B
Taylor Welder Co., 12 Atlantic St., Warren, Ohio.
"American Machinist," September 1, 1921.



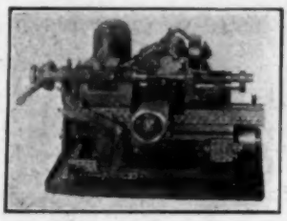
This welding machine is known as the S-4-B bench type. It has a cast copper frame, which acts as the secondary. The horns are of cold-drawn copper, 1¼ in. in diameter, and are cooled by the circulation of water in them. The distance between the horns is 3 in. when closed in the upper position, and 5 in. in the lower position. Current is applied through an automatic single-pole switch, stepped down through a 3-kw. transformer, which has a four-step regulator for adjusting the current. The machine is designed for light work such as welding, brazing and soldering. Weight, 150 lb.

Grinding Machine, Gear, Automatic
Garrison Gear Grinder Co., Dayton, Ohio.
"American Machinist," September 1, 1921.



This machine is for grinding gear teeth, by means of a wheel having a section like that of a rack tooth and generating the bearing surfaces on the gear teeth. The gear to be ground is held on the arbor below the wheel. A master gear and rack are employed for each different size and type of work. While the wheel slide reciprocates horizontally, the work is indexed entirely around. The work is then moved horizontally and rolled slightly, and the indexing repeated. Thus, after a series of steps, each tooth is completely ground on the contacting surface. The movements are provided with automatic stops. A wheel-truing device is mounted directly beneath the wheel. The machine can handle gears having pitch diameters from 2 to 9 in. and face widths up to 2 in.

Milling Machine, Thread, Automatic
Waltham Machine Works, Waltham, Mass.
"American Machinist," September 1, 1921.



The automatic features of the machine are intended to make it possible for a number of machines to be handled by one operator. After the work has been placed in position, the movements are wholly automatic. The length of the thread is the same as the amount of rise of the cam that controls the workslide. The extreme travel of the workslide is 2 in. An angular adjustment of 45 deg. on each side of the horizontal is provided for the cutter head. The drive for the workhead is made by means of a geared connection and a universal joint.

Shaper, 9-Inch
Milwaukee Shaper Co., 1023 Cold Spring Ave., Milwaukee, Wis
"American Machinist," September 1, 1921.

The machine is intended chiefly for toolroom work. All iron castings used in the construction of the machine are said to contain 40 per cent of steel. The ram has wide V-shaped bearings, scraped to fit with the ram gibs. The apron is provided with a taper gib to take up wear in the crossrail. The toolhead is graduated and swivels through an arc of 60 deg. The table is 8¾ in. long and 8 in. wide, and can be tilted to either side. The swivel vise has a graduated base, steel jaws, and an extra set of jaws for taper work.

Molding Material, for Thermit Welding

Metal & Thermit Corporation, New York, N. Y.

"American Machinist," September 1, 1921.

This molding material for thermit welding is said to prevent blowholes and assure sound welds. The action of the material is based on the theory that good silica sand will stand the heat of the thermit reaction very well, and that the weakness in all molding materials is the clay binder. The material is composed of three parts of sharp silica sand mixed with one part of Welsh mountain plastic clay. The ingredients are first thoroughly mixed in the moller with one-fortieth part glutrin by volume, and sufficient water to bring them to the proper consistency.

Clip, paste on 3 x 5-in. cards and file as desired

in specially prepared showrooms in Dayton. A variety of drilling and milling machines, lathes, presses and screw machines were shown in operation. The exhibit was in charge of Chris Seifreat.

Campagnie d'Applications Mecaniques, manufacturer of RBF ball and roller bearings, has published an interesting booklet entitled "Le Roulement a Travers les Ages." It is an historical and instructive treatise on the development of the bearing art. The book can be seen at the New York Public Library.

The Harley Company, brass manufacturer, of Springfield, Mass., has been purchased by A. W. Morris, representing New York and Philadelphia capitalists.

The Bostwick-Lyon Bronze Co., Waynesboro, Pa., has purchased the plant of the Maryland Smelting and Refining Co., Hagerstown, Md., and will merge it with the Hagerstown Bearing Metal Works.

Personals

A. P. MORROW has resigned as president of the Willys-Morrow Co., and retires from active management of the Elmira plant of the company. He will retain a financial interest in the company and will also act in an advising capacity to the directors.

RALPH E. NORTHWAY has resigned as vice-president of the Northway Motors Corporation, of Boston, Mass. He was the designer of the automobile which bears his name.

COL. GEORGE W. MIXTER has resigned as president of the Pierce-Arrow Motor Car Co. He will be succeeded by Vice-president H. E. Forbes.

A. H. D'ARCAMBAL, metallurgist of the Pratt & Whitney Co., manufacturer of tools and machinery, Hartford, Conn., will speak on "High-Speed Steel" at the February meeting of the Hartford chapter of the American Society for Steel Treating.

GEORGE W. GALBRAITH, manager of the Cincinnati (Ohio) office of the Worthington Pump and Machinery Co., was elected vice-president of the Cincinnati Engineers' Club at a meeting of the newly elected board of directors.

W. P. CHRYSLER has been elected to the presidency of the Willys-Morrow Co., to succeed A. P. Morrow who recently resigned. Mr. Chrysler was formerly president of the Buick Motor Co., and vice-president of the Willys-Overland Co.

ALBERT W. MORRIS has been elected president, and Elisha H. Brewster, treasurer, of the reorganized Harley Co. in Springfield, Mass. Plant and machinery are being put in shape for early resumption of operations.

ARTHUR BREWER, chief engineer of the Bridgeport Brass Co., Bridgeport, Conn., manufacturer of brass goods, etc., has been made works manager of the mills product division of the company.

ARTHUR JACKSON, engineering representative in Japan, of the Potter & Johnston Machine Co., has been elected a regular member of the Japan Society of Mechanical Engineers. During the war Mr. Jackson was demonstrating Gridley automatics in Great Britain.

T. W. ROGERS has been appointed representative in Toronto and Western Ontario, of Canada Foundries and Forgings, Ltd., of Brockville, Ontario.

L. A. SCHLOSSSTEIN, formerly supervisor of tools for the Robbins & Meyers Co., Springfield, Ohio, is now employed in a similar capacity with General Motors at the Plant of the Oakland Motor Co., Pontiac, Mich.

E. R. FREICHT has been appointed head of the plant engineering and maintenance departments and supervisor of maintenance of the Bridgeport Brass Co., brass goods manufacturer, Bridgeport, Conn.

JOSEPH WEISENBACH, of Chicago, has purchased the properties of the Quenelda Graphite Co., at Lineville, Ala., for $150,000, at an auction held by the receivers. The company, which operated the largest graphite plant in the South, went into bankruptcy last July. Immediate reorganization is planned and resumption of activity at the plant.

JOHN T. BELL, general sales manager of the Gurney Ball Bearing Co., Jamestown, N. Y., has resigned that position and will engage in the manufacture of a new type of anti-friction bearing. A plant has been secured at Syracuse and Mr. Bell, with several associates, will organize a company, the name of which will be announced later.

WALTER B. CLARK, works manager of the mills products division of the Bridgeport Brass Co., Bridgeport, Conn., has just been appointed general works manager of the entire plant.

Obituary

THOMAS MURRAY, assistant secretary and assistant treasurer of the United States Steel Corporation, died on Dec. 27 at his home in Sparkhill, N. Y. He was fifty-four years old.

JOHN J. CUNNINGHAM, president of the Western Foundry Co., Wingham, Ont., Canada, died on Dec. 31. He was fifty-seven years old.

HORACE THURSTON, founder of the Thurston Manufacturing Co., Providence, R. I., died at his home at Kingston on Dec. 22. He was seventy years old. Mr. Thurston was a pioneer in the manufacture of saws and cutters.

Pamphlets Received

Industrial Opportunities in New Jersey: Board of Conservation and Development, State House, Trenton, N. J. The purpose of this booklet is to exhibit, by word and picture, the advantages of New Jersey outside of the recognized industrial and suburban centers, showing a variety of locations that combine factory and home-making opportunities. The pages are replete with maps, photographs and tables of facts and figures. The board will send the booklet to anyone interested.

Steam Condensing Plant: Ingersoll Rand Co., 11 Broadway, New York City. Paper by Paul Bancel read before the American Society of Mechanical Engineers, May 16, 1921. It covers the installation and use of surface condensers. An improvement in design which eliminates to a great extent, the necessity for renewing of boiler tubes on account of leaks and corrosion. The paper discusses various phases of boiler and condenser construction and gives some practical information on vaporizing, steam distribution and temperatures.

Twist Drills: Cleveland Twist Drill Co., Cleveland, Ohio. A thirty-six page booklet presenting a brief but comprehensive collection of ideas on obtaining increased capacity, durability and general satisfactory performance in the use of twist drills. These ideas are based on the practice and observations of the Cleveland company.

Trade Catalogs

Hobbing Worms. Gould & Eberhardt, Newark, N. J. Bulletin No. 90, describing a new system of automatically hobbing worms. The machine is illustrated, as is also the more important parts connected with the operation.

Automatic Attachment. The V. & O. Press Co., Glendale, Long Island, N. Y. Bulletin No. 6-B describing a line of attachments for automatic feeds on power presses. Each type is illustrated and specifications are furnished.

Tool Service. Mehl Machine Tool and Die Co., Roselle, N. Y. Catalog describing a line of jigs and fixtures, dies, gages, patterns, special machines and methods of designing. It also contains a prospective of the Mehl tool service plan. A short history of the company, showing scenes in its present day factory, is also given.

"GF" Barrel Sand-Blast. The Pangborn Corporation, Hagerstown, Md. Bulletin describing a new machine for quantity cleaning, with small labor cost and economic operation.

Gray Planers. The G. A. Gray Co., Cincinnati, Ohio. Catalog No. 37, thirty-two neatly bound pages, describing and illustrating three types of planers—"standard." "Maximum Service" and "Switch and Frog" planers. Each type is fully illustrated and specified.

Gilfillan Products. Gilfillan Bros., Inc., Los Angeles, Cal. A supplement to catalog No. 7, describing a variety of parts for electric apparatus, including ignition, starter and generator brushes, etc.

Triplex Tool. Triplex Tool Machine Corporation, 18 East 41st St., New York City. Catalog No. 1 describing the Triplex No. 1 three-in-one machine tool. The machine is built to do milling, drilling and turning operations and it is here illustrated in the three positions.

"Brute" Trailer. Sharon Pressed Steel Co., Sharon, Pa. Circular describing a new type of truck trailer, made entirely of pressed steel.

Diamonds Used in Tools. The Arthur A. Crafts Co., 125 Summer St., Boston, Mass. A 32-page catlog, 4 x 9 in., describing the many ways in which diamond tools may be used in the industrial arts, and giving illustrations of the various settings in common use, together with examples of practical application. A brief outline of the mining and recovery of the diamond crystals is included, as is also a description of the kinds and sizes of "bortz" suitable for tools. The booklet contains valuable hints on the care and preservation of diamond tools

ERRATUM

In our issue of Dec. 22, page 1022g, appeared catalog notices for three products of the Collis Company, of Clinton, Iowa. We regret very much that the name of the company was misspelled, appearing as "Callis," and that the address was given as Clinton, Ohio, instead of Clinton, Iowa.

Forthcoming Meetings

American Society of Civil Engineers: Annual meeting Jan. 18 and 19, Engineering Societies Building, New York City. Charles W. Hunt, secretary.

United Engineering Societies: Annual meeting Jan. 26, Engineering Societies Building, New York City. A. D. Flinn, secretary.

National Association of Manufacturers: Special convention on tariff legislation, Jan. 30 and 31, New Willard Hotel, Washington, D. C. G. S. Boudinot, 50 Church St., New York City, is secretary.

American Boiler Manufacturers Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

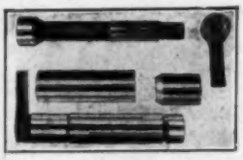
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drill, Portable, Electric, Bench-Type, "Dumore," 2-BD
Wisconsin Electric Co., Racine, Wis.
"American Machinist," Sept. 1, 1921.

This is the model 2-BD bench-type portable electric drill. The motor is of the Dumore universal type, operating on either d.c. or a.c., 25 to 60 cycles. The spindle runs in self-aligning annular ball bearings. The capacity in steel is ¼ in., and in wood ⅜ in. The motor and gearing are encased in an aluminum housing. The feed is through rack and pinion. A Jacobs chuck, 10 ft. of cord, plug and switch are supplied. Net weight, 21 lb.

Mandrel, Expanding
John Bath, Inc., Worcester, Mass.
"American Machinist," Sept. 1, 1921.

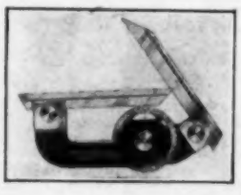


This expanding mandrel is for use on cylindrical grinding machines where accurate workmanship is necessary. The body of the mandrel has a conical shoulder under the head, which matches a similarly shaped cavity in the end of the split sleeve, while a loose bushing is fitted in the same way to the other end of the sleeve. The driving dog serves the double purpose of driving the work and of expanding the sleeve in the bore of the piece to be ground, by forcing the two cones together. The sleeve has six slots cut alternately from either end. The mandrel is made in all sizes, from 1 to 5 in., one body and bushing accommodating several sizes of sleeve.

Tap, Adjustable
Geometric Tool Co., New Haven, Conn.
"American Machinist," Sept. 8, 1921.

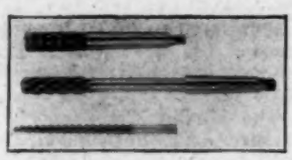
This threading tool or adjustable tap is intended for use where a machine has no means of closing a collapsible tap, or for some other reason does not permit the use of a collapsible tap. The tap is not equipped with a collapsing device. It is adjustable so that correct size can always be maintained. Each size of tap accommodates chasers for a range of diameters, and the chasers can be readily removed for re-grinding or re-placing.

Protractor, Bevel, Universal
Union Tool Co., Orange, Mass.
"American Machinist," Sept. 1, 1921.



The dial is graduated to a full circle of 360 deg. and the blades may be set at any angle. The latter are securely held in whatever position they may be set, by means of knurled thumbscrews. When tightened by means of the central clamping screw, the disks are drawn to a firm bearing on their respective seats. The blades and the clamping devices conform in design to the related parts of the combination square made by the same company. The blades and all working parts are of tool steel, hardened and ground.

Reamers and End Mill, Helical-Fluted
Gammons-Holman Co., Manchester, Conn.
"American Machinist," Sept. 1, 1921.



In this helical-fluted end mill and chucking reamer the twist is carried to a greater extreme than is the usual practice. The angle of helix is reversed from the direction of rotation. It is claimed for this construction that heavy cuts may be taken without chatter, and that the tendency to "draw in" is entirely counteracted. Both the chucking reamer and the end mill are made in all commercial sizes up to 2 in. in diameter, and larger sizes to order. The taper-pin reamer, shown at the bottom of the illustration, is now made in fifteen sizes, ranging from 0.101 in. at the small end of the smallest reamer to 1,050 in. at the large end of the largest.

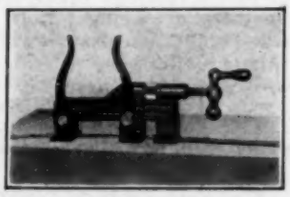
Plate, Bench, Plain
Kelly Reamer Co., 3705 West 73rd St., Cleveland, Ohio
"American Machinist," Sept. 1, 1921.

This bench plate is one of the adjuncts furnished by the concern for taking care of "Kelly" reamers, and is intended to be used when adjustments are to be made for grinding the cutters.

Drill, Portable, Electric, "Dumore," Model 1-BD
Wisconsin Electric Co., Racine, Wis.
"American Machinist," Sept. 1, 1921.

This drill is intended for use in drilling small holes, where speed and adaptability are necessary. The motor used is the Dumore universal type, operating on either direct or alternating current, 25 to 60 cycles. The power is delivered to the spindle through heat-treated steel gears of the helical type. The motor and gears are encased in an aluminum housing, the length over-all being 12½ in. Jacobs chucks are furnished as standard equipment. The capacity of the drill is ¼ in. for steel and ⅜ in. for wood. Net weight, 5 lb.

Clamp, Banding, Box
M. B. Hill, Worcester, Mass.
"American Machinist," Sept. 1, 1921.



The device is for stretching metal bands tightly upon packing cases. To operate it, the band is placed around the case in the desired position and the ends passed under the cam levers of the device. The movable jaw is then advanced along the frame by means of the screw until the requisite tension is put upon the band; and the band is nailed to the case as close to the device as may be convenient. The screw is then loosened, the ends of the bands are released from the cam levers, the device is removed, and the free ends of the band are tacked down.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., Ansonia—The Ridgewood Garage, 278 Wakelee Ave.—one small lathe for auto repair use.

Conn., Bridgeport — A. L. Adams, 307 Center St., manufacturers of cutting machinery and cloth cutters,—one 12 in. Hendey lathe, (used).

Conn., Bridgeport—The Amer. Chain Co., Inc., C. G. William, Purch. Agt.—one 80 lb. Bradly Helve hammer.

Conn., Bridgeport — The Brennan Stone Co., 202 Housatonic Ave., F. J. Brennan, Purch. Agt.—one 5 or 6 ton electric hoist for a.c. current.

Conn., Bridgeport—R. H. Gorham, R. F. D. No. 3, Box 22—one 12 in. x 5 ft. Davis lathe (used if in good condition).

Conn., Hartford—The city, P. A. Mason, Supt. of Public Bldgs.—equipment for garage and repair station on Wells and Hudson Sts.

Conn., Stratford — C. W. Beeman, 3rd Ave., Lordship Manor—small plain milling machine for automobile shop (used if in good condition).

Conn., Waterbury—M. J. Byrne, P. O. Box 884—one universal milling machine, one footpress and one positive presser blower (used if in good condition).

Ga., Rome—The Rome Stove & Range Co. —emery wheel, direct motor driven, and rattlers.

Ill., Chicago—The Force Pump Co., 1821 Berteau Ave.—one 6 in. turret lathe.

Ill., Chicago — Hollingshead & Biel, 10 South La Salle St.—one wood planer.

Ill., Chicago—The Montgomery Ward Co., 618 Chicago Ave., W. G. Baumhaggler, Purch. Agt. for Stove Div.—one surface grinder, disc 30 in.

Ill., Kankakee — The Kankakee High School Dist., c/o E. Hoennicke, 1057 Washington Ave.—manual training and domestic science equipment for proposed high school.

Ill., Urbana—The Leavitt Mfg. Co., 208-10 Griggs St., manufacturers of dehorners and dehorning appliances—one 14 in. tool room lathe 4 to 6 ft. bed with complete set of collets, etc.; one 18 in. engine lathe with 8 to 10 ft. bed equipped with 1-4 jaw chuck; one 4 ft. radial drill; one back geared punch and shear, 12 to 14 in. throat, ½ in. stroke; one 30 in. sensitive drill; one power drop hammer for handling stock up to 2 in. square.

India, Bengal, Belghorria—MacCoby Snuff Mills—one brake horse power snuff grinding machine (smallest type, latest improved).

Ky., Garth—The Elkfield Coal Co., J. C. Bowman, Pres.—electric mining machinery and equipment, mining tools, rails, switches, steel ties, cars, fans, steel plates, irons, etc., for tipple, also other mining equipment.

Ky., Louisville—The Henry Vogt Machine Co., 10th and Ormsby Sts.—machine for bending angles into complete circle.

Md., Baltimore — The Standard Electric Mchy. Co., 9 East Hill St.—two Lincoln electric welding outfits, complete (state serial numbers, etc.).

Mich., Bay City — The Garber Machine Co., Inc., 3004 North Water St.—several air compressors (garage size), also one about 5 x 6 single cylinder, belt driven; tanks with compressors; one belt driven 100 lb. Bradley hammer; one Fellows gear shaper, 36 in.; one Universal grinder 12 in. wheel by 36 in. between centers; three 14 in. x 6 ft. quick change lathes (used).

Mich., Detroit—T. J. Doyle, 4462 Woodward Ave.—service station equipment for Dodge cars.

Mich., Holland—C. Thiel, Holland Engine Bldg., 12 West 4th St.—one 8 or 9 in. accurate engine lathe, Dalton or equivalent, motor driven, 220 volt, 2 phase, 60 cycle; one Federal bench planer (used if in good condition); small motor grinder with exhaust 220 volt, 2 phase, 60 cycle, bench or floor type; catalogs of motor driven drill presses, capacity 0-½ in.

Minn., Fairmont — The Fairmont Elevator Co.—grain grinding and handling machinery, power operated.

N. J., Chrome—The United States Metal Refining Co.—circular and slitting shear to take plates up to ½ in. thick.

N. Y., Buffalo—H. Wile & Co., Ellicott and Carroll Sts.—bench lathes for screw cutting and turning.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway.—one 10 ft. power brake for use in plate shop with capacity for bending up ½ in. steel plate.

N. C., Taylorsville—C. L. Frazier—labor saving machinery for plant manufacturing wooden boxes and picker sticks.

O., Canton—The Bd. Educ.—equipment for vocational department of new McKinley High School.

O., Cincinnati — Norton-Broadway Mchy. Co., 238 Bway.—contractors' equipment, including hoisting engines, shovels, etc., also one 700 to 1,000 ft. belt driven air compressor, 100 lb. pressure and 100 to 125 hp. motor, 3 phase, 60 cycle, 220 volt, induction type with starter to operate compressor.

Okla., El Reno—The Calhoun Mchy. Exch., J. C. Calhoun, Purch. Agt. — one 250 lb. anvil; one 150 lb. vise, box type; one 50 lb. Little Giant trip hammer; one emery wheel, stand and arbor with emery wheel on one end and buffing wheel on the other end; one Little Giant punch and shear (above is for Texas delivery).

One pipe threading machine, 1¼ in. to 6 in. capacity (used); one pipe threading machine, 2½ in. to 8 in. capacity (used); one plate bending roll with drop and housing for 1½ in. plates; one 12 in. shear for No. 16 gage metal (above is for New York delivery).

One 3-ton ice freezing tank, space available 24 ft. x 24 ft.; one complete 5-ton raw water ice plant, belt driven compressor; one complete 10-ton raw water ice plant, belt driven compressor (above is for Oklahoma delivery).

O., Fremont—The Herbrand Co.—milling machines.

Ont., Dundalk—J. R. McIntyre—machinery and equipment for printing plant to replace that which was destroyed by fire. Estimated loss, $20,000.

Ont., Dundalk—W. A. Stafford—equipment for garage and auto repair work.

Ont., Essex—S. Mossop, complete equipment for modern garage and auto repair shop at Cottam.

Ont., Fort Dover — The Woodhouse Crushed Stone Co., B. W. Ball, Pres.—modern equipment for quarry, near here.

Ont., London — The Goderich Elevator Co., 85 Horton St., J. I. Hunt, Pres.—grain handling and unloading machinery also two steel unloading towers for grain elevator at Goderich.

Ont., London—The Vulcan Co., 84 Fullarton St., manufacturers of iron castings and heating equipment (and is going into new lines)—metal working machinery, lathes, planers, shapers, welding equipment, rivetters and belting.

Ont., Sarnia—The Sarnia Paper Box Co., Ltd., capital is being increased to $300,000 and will move its business to London—machinery and equipment for the manufacture of fibre and corrugated shipping containers.

Ont, Tavistock—C. Erb—machinery for planing mill and making sashes and doors.

Pa., Carbondale—The Amer. Welding Co. —one set of 10 ft. Bement boiler plate rolls.

Pa., East Pittsburgh—The Bd. Educ.—lathes and shop equipment for vocational department of high school on Howard St.

Pa., McKeesport—The Bd. Educ.—equipment for the vocatonal department of new school.

Pa., New Kensington—The Whistle Bottling Co., 4th Ave., C. Adams, Genl. Mgr.—bottling machines.

Pa., Pittsburgh — The Stonecrete Corp., 6023 Penn Ave., manufacturer of structural blocks and forms, A. Caler, Purch. Agt.—used machinery for equiping complete machine shop at new plant at Cheswick

Pa., Pittsburgh—The Union Railroad Co., Carnegie Bldg., subsidiary of the Carnegie Steel Co., one heavy shaper and one heavy shear for cutting channels.

Pa., Scranton—The Spring Service Co., 328 DuPont Court, manufacturers of auto springs, etc.—one taper roll for rolling end of spring leaves.

Pa, Sharpsville—The Coolrite Mfg. Co.—Ethyl Chloride refrigerating machines, one ton capacity.

Tenn., Chattanooga—The Amer. Mfg. Co., Cnut and Water Sts., manufacturers of harness and builders' hardware specialties —one multiple slitting shear for No. 12 gage.

Tenn., Knoxville—The Nickerson Mfg. Co., 8th Ave., manufacturers of porch and interior columns, woodwork, etc., M. F. Nickerson, Vice. Pres.—woodworking machinery for the manufacture of clothespins.

Tenn., Nashville—The Nashville Box Co., 5th and Crutcher Sts.—Morgan lock corner machine for boxes up to 18 x 18 in. in size; setting up machine for lock corner boxes; screw driving machine; trimming saw and multiple borer.

Tex., Houston—R. D. Frazier, P. O. Box 913—machinery capable of cutting and polishing perfect spheres from hard materials, such as glass, cornelian, quartz, etc.

Va., Richmond—M. & L. Repair Shop, 2104 West Broad St., V. Loxterman, Mgr.—equipment including drill press, lathes, emery grinder, etc.

W. Va., Linn—The Bd. Educ. of Glenville Dist., Linn, J. A. Radcliffe, Pres.—equipment for vocational department of new 2 story high school, at Sand Fork.

The Weekly Price Guide

This Week's Market

Pig iron quotations show reductions ranging from 50c. to $1 per gross ton. Drop of 15c. on shapes, plates, bands, bars and hoop steel; 25c. on floor plates at New York warehouses. Chicago quotes decreases of 15c. on cold finished shafting, flats, squares, hexagons and coppered bessemer rods; 25c. per 100 lb. on floor plates. No change in mill quotations.

Tin is quoted at 33c. as against 33½c. in New York. Cleveland quotes an advance of ½c. on zinc sheets (casks) and a drop of 1¼c. per lb. in babbitt metal (best grade).

Discounts on rivets, bolts, nuts and other shop supplies increased from 10 to 20 points; rubber and duck belting, second grade, quoted at a discount of 60-10 per cent as against 60-5 per cent, in the New York warehouses.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	22.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	27.50
BIRMINGHAM	
No. 2 Foundry	17.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	22.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	20.21
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel BUTT WELD Inches	Black	Galv.	Iron BUTT WELD Inches	Black	Galv.
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	3.78
Spring steel (light) (base)	6.00	6.00	....
Coppered Bessemer rods (base)	7.00	8.00	5.88
Hoop steel	3.38	3.11	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.60	....	4.98
Cold finished shafting or screw	3.55	3.50	3.40
Cold finished flats, squares	4.05	4.00	3.90
Structural shapes (base)	2.63	2.61	2.88
Soft steel bars (base)	2.53	2.51	2.78
Soft steel bar shapes (base)	2.68	2.51	2.78
Soft steel bands (base)	3.13	....	3.48
Tank plates (base)	2.63	2.61	2.88
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			33.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 5.10; New York			5.50
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	21.00	23.00	19.25
Babbitt metal (best grade)	24.62½	42.50	36.00
Babbitt metal (commercial)	9.87½	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.50	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	7.00	6.50	8.50
Brass, light	5.00	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.76	.74
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	.....	per net ton	$2.75
Coke, prompt foundry, Connellsville	.....	per net ton	3.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	—60%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	-60-10-10%	-60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	-65-5%
Lag screws, coach screws	65%	.....	—60%
Carriage bolts, up to 1 in. x 30 in.	-50-10%	-50-10-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	—55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	—75%	—80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$4.50	$5.50	$3.50
Washers, cast iron, ¼ in. per 100 lb. (net)	3.75	3.75	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.00	4.00
Rivets:			
Rivets, ½ in. dia. and smaller	60-5%	60-10-10%	-65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ⅝-in., ¾-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	40-10%	50-10%
Copper burs	40%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	List $9.00 less 20-10-5%	50–10–5%	-20-10%
Emery paper	List 11.00 less 20%	$11.00 net	-20%
Emery cloth	List 32.75 less 10%	32.75 net	-10%
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net	.....	list+10%	
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	List $1.65 less 20%	.....	-10%
Cloth	List $3.55 less 10%	.....	-10%

Wis., Appleton—The County Bd. of Outagamie County, A. G. Brusewitz, Comr.—appropriated $20,000 for small tools and equipment for the county garage and machine shed.

Wis., Cudahy—P. & J. Motor Co., 1006 Packard Ave., B. F. Palmer, Pres.—drill presses, one drilling machine, several boring mills, one planer, two lathes, one turret lathe and power machinery.

Wis., Eagle River—Radcliffe & Co., manufacturers of woodworking products—woodworking and special machinery for new lath mill.

Wis., Hartford—Gehl Bros. (monuments)—light crane and marble cutting equipment.

Wis., Hortonville — W. L. Schroeder—special canning machinery.

Wis., Milwaukee — The Badger State Realty Co., 504 11th Ave.—one belt sander.

Wis., Milwaukee—The Dort Motor Car Co., 242 4th St., L. F. Mitchell, Purch. Agt.—small drill press.

Wis., Milwaukee—E. J. Findlin, 38 34th St.—small engine lathe.

Wis., Milwaukee—H. Grimes, 1165 35th St.—one 30 in. band saw and planer.

Wis., Milwaukee—J. Guschl, 831 45th St.—(carpenter)—woodworking machinery.

Wis., Milwaukee — F. Luenzmann Co., 31st St. and Auer Ave.—cross cut saw, rip saw and surfacer.

Wis., Milwaukee—T. F. Merrill, 383 5th St.—arbor press.

Wis., Milwaukee — The Milwaukee Radiator Mfg. Co., c/o R. I. Kenney, 120 Wisconsin St.—sheet metal machinery to manufacture auto radiators.

Wis., Milwaukee—The Modern Candy Co., c/o F. Heinl, 1059 4th St.—candy machinery, operated by electric motors.

Wis., South Milwaukee—J. Nirschl, Jr., 1220 Manitoba Ave. — Universal woodworker, 6 or 8 in. sticker, motor driven.

Wis., Milwaukee — The Raymond Mfg. Co., c/o W. H. Schmahl, 77 Cawker Bldg., manufacturers of auto accessories — one electric welder and one circle saw or power hack saw.

Wis., Milwaukee—The Richards Machine Co., 3417 Vliet St.—machine tools including lathe, shaper, grinder and drill press (used preferred).

Wis., Miwaukee—The Rosenberg Elevator Co., 174 Reed St., E. Rosenberg, Purch. Agt.—power hack saws.

Wis., Milwaukee—Starck Bros., 1212 National Ave., carpenters and mill workers—one 4 to 6 in. sticker.

Wis., Neillsville — The Neillsville Milk Products Co., E. Scheele, Purch. Agt.—belt driven separators, churns, coolers and refrigeration machinery.

Wis., Neillsville—E. Scheel, manufacturer of dairy products—refrigerating machinery, power machinery and other dairy equipment.

Wis., Wausau—C. Lotz, 1016 Grand Ave. woodworking machinery and equipment for lath mill.

Wis., Wauwatosa—R. Mueller, P. O. Box 515—one 10 or 12 in. joiner.

Wis., Wauwatosa—R. Van Nostrand, 381 5th Ave.—one 30 to 32 in. band saw.

Wis., West Bend—The Goldbaum Laundry—complete equipment for small laundry, electric power preferred.

Wis., Wisconsin Rapids — The Consolidated Water Power & Paper Co., G. W. Mead, Purch. Agt.—one monorail crane.

Metal Working Shops

Cal., San Francisco—R. W. Kern has awarded the contract for the construction of a 1 story garage on Jones St., north of O'Farrell St. Estimated cost, $39,400.

Conn., Bridgeport—The Union Specialty Co., 138 Hurd Ave., has awarded the contract for the construction of a 2 story, 50 x 125 ft. factory on Oak St., for the manufacture of metal specialties. Estimated cost, $50,000. Noted Dec 20.

Conn., East Hartford (Hartford P. O.)—H. E. Bidwell, 209 State St., Hartford, is receiving bids for the construction of a 1 story, 50 x 122 ft. and 20 x 122 ft. garage and auto sales and service station on Connecticut Blvd. Estimated cost, $40,000. Associated Architectural & Eng. Co., 145 State St., Springfield, Mass., archts. Noted Dec. 22.

Conn., Hartford—F. C. Walz, Archt., 407 Trumbull St., is receiving bids for the construction of a 2 story, 85 x 190 ft. garage and repair shop on Main and South Prospect Sts., for Herchman & Levine, 223 Main St. Estimated cost, $125,000.

Conn., Stamford—A. Spelke, 292 Main St., has awarded the contract for the construction of a 1 story, 60 x 160 ft. garage and service station on Gay St.

Ind. Ft. Wayne—The Bd. Educ. is having plans prepared for the construction of a 2 story, 80 x 150 ft. gymnasium and shop building. Estimated cost, $200,000. C. Weatherhogg, Citizens Trust Bldg., Archt.

Ind., Richmond — The Peille Co. has awarded the contract for the construction of a 2 story, 260 x 500 ft. factory for the manufacture of fire doors. Estimated cost, $200,000.

Ind., Richmond—The Reliance Fdry. Co. is having plans prepared for the construction of a 1 story, 85 x 110 ft. foundry. Estimated cost, $25,000. J. Mueller & Co., Palladium Bldg., Archts.

Mich., Detroit—T. J. Doyle, 4462 Woodward Ave., has had plans prepared for the construction of a 1 story, 60 x 451 ft. garage and service station on Jefferson Ave. and Chene St. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts.

O., Cleveland—J. L. Free, 1004 Prospect Ave., has awarded the contract for the construction of a 1 and 2 story, 38 x 80 ft. and 50 x 113 ft. office building and garage, at 1530 and 1618 Brownell Ct. Estimated cost, $60,000.

O., Cleveland—The Hess-Schenk Machine Tool Co., 801 St. Clair Ave., has awarded the contract for altering its 3 story, 48 x 76 ft. factory. Estimated cost, $40,000.

O., Cleveland—Moody & Thomas Milling Co., 6312 Kinsman Rd., has awarded the contract for the construction of a 1 story, 50 x 150 ft. warehouse and garage on Park Ave. near East 66th St. Estimated cost, $50,000. Noted Dec. 8.

Ont., Cottam—S. Mossop, Essex, plans to build a garage and auto repair shop here. Estimated cost, $42,000.

Ont., Dundalk—W. A. Stafford plans to rebuild his garage which was destroyed by fire. Estimated loss, $45,000.

Ore., Portland—The Imperial Investment Co., Concord Bldg., will soon award the contract for the construction of a 5 story, 100 x 100 ft. garage on 4th and Pine Sts. Estimated cost, $150,000. Sutton & Whitney, Lewis Bldg., Archts.

Pa., Dubois—The Triumph Motor Truck Co. of Medina, N. Y., has purchased a site here and plans to build a plant for the manufacture of motor trucks.

General Manufacturing

Cal., Napa—The Union Ice Co., 354 Pine St., San Francisco, is having plans prepared for the construction of a cold storage warehouse and ice plant (20 tons daily capacity), here. Estimated cost, $50,000. W. H. Toepke, 942 Market St., San Francisco, Archt.

Conn., Boardman—The New England Lime Co., 226 Main St., Danbury, plans to rebuild its lime plant, here, which was recently destroyed by fire. Estimated cost, $100,000. Private plans.

Conn., New Haven—The Seamless Rubber Co., Inc., Hallock St., is having plans prepared for the construction of a 1 story, 140 x 160 ft. addition to its plant. Estimated cost, $100,000. R. W. Foote, 185 Church St., Archt.

Ill., Chicago — The Atwell Printing & Binding Co., Sherman and Polk Sts., plans to build a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St. Estimated cost, $700,000. Architect not selected.

Ill., East St. Louis—The Obear Nestor Glass Co., Bway. and Belt St., plans to build a 1 story addition to its glass factory. Private plans.

Ind., Ft. Wayne—The Superior Baking Co., 1702 South Calhoun St., is having plans prepared for the construction of a 1 story, 50 x 90 ft. bakery on South Calhoun St. Estimated cost, $25,000. A. Mahurin, Lincoln Life Bldg., Archt

Ind., Indianapolis—The Brannum-Keene Lumber Co., East Washington St., plans to build a lumber plant on East Washington St. Estimated cost, $150,000. Architect not selected.

Ind., Indianapolis—Piel Bros. Starch Co., 831 State Life Bldg., will receive bids until Jan. 18 for the construction of a 1 story, 85 x 150 ft. starch factory on Drover St. Estimated cost, $20,000. R. F. Daggett, 962 Lemcke Annex, Archt. Noted Dec. 15.

Ind., Linton — The Chero-Cola Bottling Co. is having plans prepared for the construction of a 1 story, 44 x 80 ft. factory. Estimated cost, $25,000. J. Fritz, Linton, Archt.

Ky., Louisville — The Standard Printing Co., 220 South 1st St., has awarded the contract for the construction of a 4 story, 70 x 100 ft. printing plant at 220-28 South 1st St., and for altering adjoining plant at 220 South 1st St. Estimated cost, $150,000.

Ky., Louisville — The Standard Sanitary Mfg. Co., 6th and A Sts., has awarded the contract for the construction of a 1 story, 53 x 404 ft. enameling plant. Estimated cost, $80,000. Noted Nov. 17.

Mass., South Hadley—The Larose Dairy Co., Inc., has awarded the contract for the construction of a 2 story, 40 x 60 ft. dairy and refrigerating plant on Falls Rd. Estimated cost, $30,000.

Mich., Ypsilanti — The Owen Sanitarium Co. is having plans prepared for the construction of a sanitarium and industrial plant for bottling mineral water, making soap and tooth paste. Estimated cost, $800,000. Menefee & Streeter, 706 Marquette Bldg., Detroit, Archts.

Minn., Minneapolis — The Bd. of Park Comrs., City Hall, plans to construct a 2 or 3 story storehouse and laundry on Lyndale Farmstead. Total cost, $175,000. Bond issue and sale of $75,000 has been authorized to construct portion of buiding. J. A. Ridgway, Secy.

Mo., Kansas City—The Superior Ice & Storage Co., Lee Bldg., will build a 3 story ice plant on 2nd and Main Sts. Estimated cost, $150,000. Noted Oct. 6.

N. J., Linden—The Warner Quinlan Co., 79 Wall St., New York, has awarded the contract for the construction of a refinery and asphalt plant, here. Estimated cost, $2,000,000.

N. Y., Brooklyn — Werbelovsky Bros., Flushing Ave., manufacturers of glass, will soon receive bids for the construction of a 3 story factory on Flushing Ave. Estimated cost, $175,000. M. Klein, 37 Graham Ave., Archt. and Engr.

N. Y., New York—Fordham University, Fordham Rd., is having sketches made for a printing plant on Fordham Rd. and Bathgate Ave. Estimated cost, $250,000. R. J. Reilly, 477 5th Ave., Archt. and Engr.

N. Y., New York—The New York Times, Times Sq., is having plans prepared for the construction of an 11 story, 100 x 143 ft. printing plant and office building at 217 West 43rd St. Ludlow & Peabody, 101 Park Ave., Archts. and Engrs.

O., Cleveland—The Cuyahoga Mill Work Co., 2615 East 29th St., plans to build a 1 story warehouse and mill on Grand Ave., along the tracks of the New York, Chicago & St. Louis R.R. Estimated cost, $40,000. Private plans.

O., Columbus — H. C. Godman Co., 31 North 4th St., plans to build a 4 or 5 story, 147 x 230 ft. shoe factory on Starling St. Estimated cost, $300,000. Architect not selected.

O., Dayton—P. Kuntz Lumber Co., Norwood Ave., has awarded the contract for the construction of a 1 story, 60 x 110 ft. woodworking plant on Mound and Norwood Sts. Estimated cost, $25,000.

O., Norwood—The Federal Garage Co., Cincinnati, has awarded the contract for the construction of a 4 story garage here. Estimated cost, $140,000.

Ont., Fort Dover — The Woodhouse Crushed Stone Co. plans to develop a quarry near here. Estimated cost, $50,000. B. W. Ball, Pres.

Ont., Ottawa—The Hamilton Tar & Ammonia Co., Lees Ave., plans to construct a factory for the manufacture of tar and ammonia. Estimated cost, $50,000. W. M. Currie, Pres.

Pa., Altoona—The Caums Ice Cream Factory Co., 5th Ave. and 9th St., plans to build a 2 story, 25 x 120 ft. addition to its factory. Estimated cost, $45,000. E. A. Caum, Mgr.

Pa., Erie—The Times Publishing Co., 11 West 9th St., is having plans prepared for the construction of a 2 story, 90 x 165 ft. publishing plant on 10th St. Cody, Hicks & Davidson, Ariel Bldg., Archts.

R. I., Pawtucket—J. and P. Coats, Inc., 266 Pine St., have awarded the contrac for the construction of a 1 story, 110 x 320 ft. thread bleachery. Estimated cost, $150,000.